高雄醫學大學 104 學年度學士後醫學系招生考試試題

科目：英文　　考試時間：80 分鐘

說明:一、「選擇題」用2B鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液（帶），未遵照正確作答方法而致電腦無法判讀者，考生自行負責。

二、「非選擇題」部分以「答案卷」作答，作答時不得使用鉛筆，違者該科答案卷不予計分；限用黑色或藍色墨水的筆書寫。

三、試題、答案卡及答案卷必須繳回，不得攜出試場。

I. Vocabulary: 20 points

【單選題】每題 1 分，共 20 題，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

A. Please choose the <u>best</u> answer to match with each underlined word.

1. Video has played a huge role in relationships between citizens and the police over the last 25 years. It has helped hold the police **<u>accountable</u>** for abuse and also protected them from false allegations.
(A) accusatory (B) innocent (C) explicable (D) resentful (E) psychopathic

2. The U.S. Armed Forces are stepping up **<u>surveillance</u>** of disputed islands in the South China Sea amid rising tension with Beijing.
(A) slack (B) cessation (C) discontinuance (D) termination (E) observation

3. The **<u>hallucinogenic</u>** potion made from yahay vine can cause intoxication.
(A) supercilious (B) genetic (C) imprudent (D) psychoactive (E) addictive

4. Laser surgery for near-sightedness **<u>obviates</u>** the need for wearing glasses.
(A) precipitates (B) precludes (C) precedes (D) predicates (E) preordains

5. The Chinese armed forces have been strengthening their air and naval combat capabilities in the region, as U.S. forces expanding their involvement in **<u>contention</u>** over the islands.
(A) amity (B) disagreement (C) cordiality (D) discussion (E) accord

B. Please choose the <u>best</u> answer to complete each sentence.

6. Being accused of discriminating against Asian-American applicants, Harvard University responded that the school's admission policies are fully _____ with the law.
(A) compliant (B) complaint (C) compliment (D) complementary (E) complement

7. A four-year _____ that sampled microbes from across the world’s oceans is bringing the mechanisms of climate change into focus.
(A) exploitation (B) exemplification (C) exploding (D) expansion (E) expedition

8. A batch of sodium chloride manufactured by Y F Chemical Corp. was _____ with bacteria, resulting in fevers for eight patients after they were injected with the solution.
(A) purified (B) disinfected (C) obstructed (D) confined (E) tainted

9. Resettling refugees is a global _____ obligation. Many of these countries, including the United States, have taken in refugees from that part of the world over the last several years.
(A) hostile (B) humanitarian (C) antagonistic (D) oblivious (E) indifferent

10. The rich and famous can have as hard a time protecting their money as everyone else. Most people, unfortunately, are _____ to spend more than they have.
(A) immune (B) resistant (C) insensitive (D) predisposed (E) insusceptible

11. While WHO is confident that Liberia has interrupted transmission of Ebola, outbreaks persist in neighboring Guinea and Sierra Leone, creating a high risk that infected people may cross into Liberia over the region’s exceptionally _____ borders.
(A) impermeable (B) tight (C) overpassing (D) porous (E) inapproachable

12. Two years ago, Muslim militias, known as the Seleka, seized power, then plundered the country from precious—diamonds, gold and ivory to mundane—guns, cars and food. A group of mainly Christian and animist militias later _____, and drove the Seleka into the countryside.
(A) reconciled (B) conceded (C) retaliated (D) negotiated (E) recapitulated

13. Women's confinement to their home and dependence on personal servants for their every need left them powerless and _____ to their husbands and other males in the family.
(A) numb (B) exclusive (C) risky (D) reluctant (E) subservient

14. Business schools, responding to demand by students and employers for more global exposure, have started _____ international programs into their curricula in the last decade or so.
(A) intimidating (B) alternating (C) recruiting (D) incorporating (E) juxtaposing

15. The fireworks were in perfect _____ with the music.
(A) synchronization (B) endurance (C) enumeration (D) vitalization (E) resurgence

16. The _____ in relations between the U.S. and Cuba has led to a stunning 36 percent increase in visits by Americans to the island.
(A) thaw (B) tension (C) conflict (D) attack (E) transaction

17. Floodwaters deepened across much of Texas as storms dumped almost 30 centimeters of rain on the Houston area, stranding hundreds of motorists and _____ the famously congested highways.
(A) invigorating (B) illuminating (C) inundating (D) disseminating (E) facilitating

18. One of the predicted consequences of global warming is the rising sea levels. This salty seawater will _____ low-lying streams, rivers and underground freshwater aquifers—the sources of drinking water for millions of people worldwide.
(A) infiltrate (B) outbreak (C) summarize (D) undertake (E) overcome

19. Head delegations from the countries are now at the negotiation tables in the first round of _____ talks, the results of which are hoped to be the beginning of improved relations between the two nations.
(A) bicameral (B) bifocal (C) binomial (D) bilateral (E) bipedal

20. It is statistically proven that after a person's early 20's, the fascination with _____ declines, and his/her resistance to change increases.
(A) magnificence (B) novelty (C) replicas (D) commodity (E) amusement

II. Grammar and Structure: 20 points

【單選題】每題 1 分，共 20 題，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

A. Please choose the <u>best</u> answer to complete each sentence.

21. Developing a strategy that your company or military cannot execute, _____ wonderful, is simply bad strategy.
(A) regardless (B) no matter (C) no matter how (D) regardless of (E) no matter whether

22. Jony Ive, _____ with designing many of Apple's most successful products, has been promoted to be chief design officer.
(A) credits (B) crediting (C) is crediting (D) credited (E) has credited

23. _____ a global nuclear war, life on earth as we know it would end forever.
(A) There should be (B) If there will be (C) If there had been (D) Should there be (E) Had there been

24. _____ the catastrophic flooding of New Orleans was caused not merely by a powerful storm but primarily by fatal engineering flaws in the city's flood protection system has been proved by experts.
(A) This (B) That (C) While (D) However (E) Which

25. Hospitals are competing for a decreasing market share; _____, they are attempting to discover the most cost-effective and highest quality care.
(A) however (B) on the whole (C) in other words (D) for example (E) consequently

26. "If not us, who is going to take care of the _____ Christians in Iraq, being one of the longest Christian communities ever in existence?" Jeb Bush said during a speech in Oklahoma City.
(A) persecuting (B) persecuted (C) being persecuted (D) having persecuted (E) persecution

27. Scientific discoveries often happen unintentionally. In the early 20th century, Alexander Fleming noticed that the mold growing on one of the culture plates in his lab was killing all of the bacteria, _____ him to discover antibiotics.
(A) had lead (B) was leading (C) lead (D) leading (E) have lead

28. Joey Alexander, whose parents are Christians, _____ his unique talent as being "a gift from God."
(A) distributes (B) attributing (C) commits (D) committing (E) attributes

29. When a patient is near death, a doctor should not be obliged to embark upon or continue heroic treatment _____ has no prospect of benefiting the patient.
(A) in which (B) from which (C) which (D) whom (E) for whom

30. Sting, a supporter for humanitarian and environmental causes, established the Rainforest Foundation, an organization, _____.
(A) whose goal is to help save the world's rainforests (B) who goal is to help save the world's rainforests
(C) that goal is to help save the world's rainforests (D) which goal is help save the world's rainforests
(E) whatever goal is to help save the world's rainforests

31. Ethnocentrism is the view that one's own culture is better than all others. People will always find some aspect of another culture distasteful, _____ sexual practices, a way of treating friends or relatives, or simply a food that they cannot manage to get down with a smile.
(A) be it (B) owing to (C) whereas (D) yet (E) unless

32. She will not say what the item is, claiming that she won't divulge the secret of a valuable or important item to people she does not know and can _____ be expected to trust.
(A) hardly (B) merely (C) simply (D) almost (E) easily

B. For each sentence, please choose one underlined part that contains <u>faulty</u> English.

33. During the "dot-com" bubble in the United States <u>which has lasted</u> (A) from the mid-1990s to 2001, many companies, <u>to increase</u> (B) market share, purposely sold products <u>at a loss</u> (C), a scheme <u>they believed would</u> (D) increase the company's customer base and <u>lead to</u> (E) future profits.

34. The truth is, Geraldine, <u>that in</u> (A) your case as <u>an</u> (B) undergraduate student, you are not studying <u>adequate enough</u> (C), and you may find yourself in an <u>awkward predicament</u> (D) sometime soon <u>in the near future</u> (E).

35. The fact is that still we do not know <u>why some people become</u> (A) addicts and others do not although there are many theories <u>that reason</u> (B) that some people simply have an "addictive personality type", being far more <u>susceptible to</u> (C) the reward mechanism that produces addiction while others still believe that it is the addicts' <u>lack of</u> (D) will power to refrain <u>without</u> (E) taking drugs or alcohol.

36. In Antarctica, a massive wall <u>that</u> (A) for years <u>was</u> (B) an obstacle to whale watchers <u>receded</u> (C) in 2010 <u>to reveal</u> (D) a shallow channel full of <u>feeding humpbacks</u> (E).

37. <u>Comparing</u> (A) <u>its</u> (B) competitors in the energy space, the renewable energy industry is young. The biggest renewable energy employers, solar PV (1.6 million jobs) and wind (356,000), <u>blow away</u> (C) the number of people <u>employed</u> (D) in either of those industries in any other country, by <u>multiples</u> (E).

38. When <u>asking</u> (A) to conserve water, many people were <u>disappointed</u> (B) that the government did not set a similar mandate <u>for age</u> (C). Before the order, the state <u>had</u> (D) already turned off the tap for many farmers. And now it's making further <u>cuts</u> (E).

39. <u>Neither</u> (A) another penny <u>will</u> (B) we spend <u>on</u> (C) your education <u>unless</u> (D) your grades improve and you become responsible <u>for</u> (E) your work.

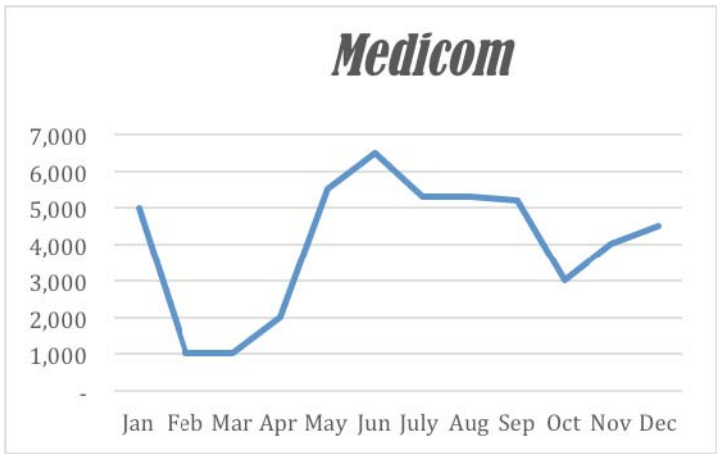
40. Facebook <u>has had</u> (A) internal question-and-answer sessions <u>whose</u> (B) employees can pose questions <u>to</u> (C) CEO Mark Zuckerberg <u>on</u> (D) topics <u>ranging</u> (E) from the social media site itself to the direction of the company.

III. Reading Comprehension: 30 points

【單選題】每題 2 分，共 15 題，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

Please read the following chart/excerpts/passages closely and then choose the best answer for each of the questions according to the contents.

Medicom (sales in thousands)



41. According to the chart, in which period did the sales plummet most dramatically?
(A) January ~ February (B) April ~ May (C) June ~ July
(D) September ~ October (E) October ~ November

For many people, certain fiction books have a special meaning. A story that a person read when they were young, for example, can make them nostalgic for their childhood. But why should people read them? To people who enjoy reading fiction books may simply find them irresistible. On the contrary, people who are not interested in fiction may find it monotonous and boring, or they feel the formal language of literature is unintelligible. Many people prefer reading nonfiction or the news because the language is more straightforward and easier to understand. However, some researchers believe they have found definitive proof that reading fiction is actually beneficial for the human brain. A research team at the University of Toronto led by Professor Maja Kjikic, for example, found that people who read literary fiction become more open-minded and creative in their thinking, and are also better able to deal with uncertainty.

42. People who do not appreciate fiction think _____.
(A) fiction reading is illegible and literature language is humdrum
(B) fiction reading is humdrum and literature language is incomprehensible
(C) both fiction reading and literature language are difficult
(D) neither fiction reading or literature language is critical
(E) fiction reading is incomprehensible and literature language is humdrum

43. Based on the researches, people who enjoy reading fiction might _____.
(A) deal carefully with abstract task
(B) develop a mind of better tolerance and work effectively under ambiguity
(C) monitor carefully about uncertainty
(D) think critically before taking action
(E) read decisively to avoid disastrous consequences

Distinguishing between which kind of stress we feel can sometimes be tricky. Stress is sometimes meant to benefit us, but this does not always happen. Some students find that the stress from taking tests enhances their performance, while others find that test taking makes them forget everything they know. Psychologists note that the type of stress we feel is also tied to the kind of personality we have – Type A or Type B. People with Type A personality frequently feel distress. They tend to be very competitive and often labeled “workaholics” because they devote so much time and energy to their work in order to ensure their success. Unfortunately, focusing much on work and deadlines can make them feel excessive amount of distress. Because they are naturally more impatient and uptight, the distress Type A people feel comes predominantly from themselves. People of Type B are exact opposite: more relaxed and easygoing. Instead of being upset when sitting in traffic jam, people of Type B would not let the situation control how he or she feels. They find it easier to adapt to change. They are able to deal with stress in a more positive and effective way, which results in their experiencing more eustress than distress.

44. Which is the best title for the essay above?
(A) Personality and Stress: Classification and Correlation
(B) Personality and Stress: Performance and Enhancement
(C) Personality and Stress: Distress and Eustress
(D) The Influence of Personality on Stress
(E) Personality: Typology

45. Based on the reading above, which of the following statement is correct?
(A) Stress is always beneficial to us.
(B) Type B people tend to devote time and energy to their work.
(C) The stress Type A people experience results mainly from themselves.
(D) People of Type B often have difficulty in adapting to uncertainty.
(E) Type B people tend to think negatively, which results in their experiencing constant distress.

Millie is a petite woman who looks younger than her 57 years, but she has a failing heart. Even the smallest amount of physical exertion causes shortness of breath and other symptoms such as arm pain, so her cardiologists brought in the __(47)__ care team.

The team was asked to help manage Millie's pain and other symptoms and to help her grapple with the knowledge that her heart was losing its ability to pump strongly enough. They were also asked to help her with decision-making.

Millie could go home on her intravenous medication, but neither her son nor her daughter was going to be able to accommodate her needs. This is a common scenario in today's families, so the medical care team had to move to plan B – a nursing home. But no nursing home could be found that would accept a patient on this type of medication. What came next? Next, was plan C – living in the hospital.

Millie is now living in the hospital and receiving her medications. With Plan C in operation, the palliative care team has continued to help Millie feel as comfortable as possible and experience the best possible quality of life. This included providing the services of a massage therapist and transforming her hospital room with a beach motif so Millie could feel the freedom that the sea and sand always gave her. With the help of palliative care even her appetite improved! One day Millie said, "I would love some grilled salmon and rice. And if you can find some sugar-free ice cream, that would just be delightful."

46. What is the major problem that Millie suffers from?
(A) being rejected by her family (B) heart failure (C) bad appetite
(D) heavily relying on sugar (E) compelled to live by the sea

47. What is the most appropriate word for the blank in the first paragraph?
(A) palliative (B) emergency (C) chronic (D) rehabilitative (E) acute

48. What is the major improvement achieved by the medical team?
(A) recovery from the illnesses
(B) sustaining her life quality
(C) improving her living environment
(D) her union with her family
(E) discharging her from nursing home

49. What is the synonym of the word **exertion** in the first paragraph?
(A) overdose (B) stretch (C) experience (D) extension (E) activity

More than 3 million years ago, when "Lucy" was roaming the savannah of present-day Ethiopia, she may have encountered other two-legged apes not unlike her own species, *Australopithecus afarensis*—yet still just a wee bit strange.

Represented by jawbones from three individuals, a newly described species named *Australopithecus deyrimeda* adds to the scatter of evidence that not one, but a range of hominin species populated the East African landscape before 3 million years ago. This could imply they were able to carve out separate niches in a stable environment based on differences in diet, foraging strategies and other behaviors.

"We don't know enough yet to say anything about the nature of interaction or ecological differences between *A. afarensis* and *A. deyiremeda*," says Stephanie Melillo of the Max Planck Institute for Evolutionary Anthropology. "We have to first know how to tell the two species apart from their fossil remains, and that is what this paper was all about."

Reported Wednesday in *Nature*, the new specimens—a partial upper jaw, two lower jaws, and some other fragments—were found at Burtele, in the Afar Triangle of Ethiopia, just a day's walk from Hadar, where Lucy was found in 1974. Sediments surrounding the bones were dated to 3.3 and 3.5 million years ago, a time when *A. afarensis* is well known to have inhabited the region. While the new jaws share some characteristics with Lucy's species, they differ in other respects. Some of the teeth have different root structures, and in general are smaller than *A. afarensis* teeth, a trait that could indicate a shift in diet.

"Smaller teeth are often associated with a more meaty diet," says Fred Spoor of University College London and the Max Planck Institute for Evolutionary Anthropology. "And the chewing muscles have migrated forward, which suggests a redistribution of chewing forces of some sort."

The species name, *A. deyrimeda*, derives from the local words for "close" (deyi) and "relative" (remeda)—signaling the species close relationship with other hominins. But the similarities only go so far.

"We are convinced that it is different from *A. afarensis*. All of the evidence—published and unpublished—that we have from the localities at Burtele support our conclusion," says study author Yohannes Haile-Selassie of the Cleveland Museum of Natural History. He notes that folding the new specimens into *A. afarensis* would introduce an extremely unusual amount of physical variation into the existing species.

Still, "the distinctions are very, very subtle," says paleoanthropologist Bill Kimbel of the Institute of Human Origins. "I think the authors have done a very nice job in analyzing the material, but I think it's a judgment call as to whether you think the differences amount to a species-level difference."

A. afarensis remains by far the most conspicuous hominin in the fossil record of East Africa 3 to 4 million years ago, during a period known as the Middle Pliocene. But in the last two decades, scientists have named several others, including *Australopithecus bahrelghazali* from Chad, and *Kenyanthropus platyops* from Kenya. *A. deyrimeda* further swells the crowd.

"There is now incontrovertible evidence to show that multiple hominins existed contemporaneously in eastern Africa during the Middle Pliocene," the authors write.

Of special interest are some enigmatic foot bones of a hominin recovered in 2009 very close to where *A. deyiremeda* was unearthed. The bones suggest a creature with a flexible foot and big toe capable of grasping objects, similar to a more primitive hominin called *Ardipithecus ramidus*, dated to 4.4 million years ago.

But perplexingly, the foot bones at Burtele date back to just 3.4 million years ago: the same time period as *A. deyiremeda*. It's a combination of proximity in both space and time that cannot be ignored, Kimbel says.

"Figuring out whether or not that very primitive foot is the same critter as the clear australopithecine teeth and jaws that are being described now is of utmost importance," Kimbel says. "It would mean that you could have australopithecus-like heads with more diverse options for locomotion – which is not a picture we have painted so far."

50. How many hominins reside in the eastern African before 3 million years ago?
(A) one (B) two (C) more than two
(D) none (E) The answer is still controvertible.

51. The name given to the newly discovered species is _____.
(A) *Australopithecus afarensis*
(B) *Australopithecus deyrimeda*
(C) *Australopithecus bahrelghazali*
(D) *Kenyanthropus platyops*
(E) *Ardipithecus ramidus*

52. According to the article, the newly discovered species might ingest more _____ than Lucy's species.
(A) water (B) salt (C) fruit (D) vegetable (E) meat

53. The word, deyrimeda, derives from the local words for "close" (deyi) and "relative" (remeda). Therefore, deyrimeda is a word made by _____.
(A) compounding (B) abbreviating (C) blending
(D) coining (E) assimilating

54. In the ninth paragraph, the word "conspicuous" may be replaced by_____.
(A) noticeable (B) intelligent (C) prosperous (D) ferocious (E) sentimental

55. *Australopithecus* is more like _____.
(A) monkeys (B) apes (C) ape-men (D) humans (E) aliens

IV. Essay Writing: 20 points

Please write a well-organized essay with at least 200 words to express your opinion on medical malpractice.

"Statistics show that approximately 195,000 people are killed every year by medical errors in the US. Between 15,000 and 19,000 malpractice suits are brought against doctors each year." Are there efficient and practical ways to reduce the rate of medical error? Should doctors be solely responsible for their errors? What sort of legal protection should doctors be entitled to?

高雄醫學大學 104 學年度學士後醫學系招生考試試題

科目：普通生物學　　考試時間：80 分鐘

說明：一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。
二、試題及答案卡必須繳回，不得攜出試場。

I.【單選題】1-60 題，每題 1 分，共計 60 分。答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

1. Tay-Sachs disease is a human genetic abnormality that results in cells accumulating and becoming clogged with very large, complex, undigested lipids. Which cellular organelle must be involved in this condition?
(A) mitochondrion (B) lysosome (C) endoplasmic reticulum
(D) Golgi apparatus (E) ribosome

2. Several of the different globin genes are expressed in humans, but at different times in development. What mechanism could allow this?
(A) pseudogene activation
(B) exon shuffling
(C) differential translation of mRNAs
(D) differential gene regulation over time
(E) natural selection

3. Most causes of speciation are relatively slow, in that they may take many generations to see changes, with the exception of _____.
(A) colonization (B) sexual selection (C) reinforcement
(D) natural selection (E) polyploidy

4. Leaf thickness represents a trade-off between _____.
(A) water retention and carbon dioxide absorption
(B) light collection and carbon dioxide absorption
(C) water retention and oxygen absorption
(D) light collection and oxygen absorption
(E) light collection and water retention

5. What is the only type of chemical signal that does not alter the physiology of the animal producing that signal?
(A) paracrine (B) pheromones (C) neuroendocrine
(D) neural (E) none of above

6. Which of the following causes populations to shift most quickly from an exponential to a logistic population growth?
(A) competition for resources (B) favorable climatic conditions (C) decreased death rate
(D) removal of predators (E) increased birth rate

7. Matter is gained or lost in ecosystems. How does this occur?
(A) Heterotrophs convert heat to energy.
(B) Photosynthetic organisms convert solar energy to sugars.
(C) Chemoautotrophic organisms can convert matter to energy.
(D) Matter can be moved from one ecosystem to another.
(E) Detrivores convert matter to energy.

8. Which of the following provides the best evidence of a biodiversity crisis?
(A) the incursion of a non-native species
(B) climate change
(C) increasing pollution levels
(D) decrease in regional productivity
(E) high rate of extinction

9. An earthquake decimates a ground-squirrel population, killing 98% of the squirrels. The surviving population happens to have broader stripes, on average, than the initial population. If broadness of stripes is genetically determined, what effect has the ground-squirrel population experienced during the earthquake?
(A) disruptive selection (B) a genetic bottleneck (C) directional selection
(D) a founder event (E) stabilizing selection

10. If a cell has completed meiosis I and is just beginning meiosis II, which of the following is an appropriate description of its contents?
(A) It has double the amount of DNA as the cell that began meiosis.
(B) It has one-fourth the DNA and one-half the chromosomes as the originating cell.
(C) It has half the amount of DNA as the cell that began meiosis.
(D) It is identical in content to another cell formed from the same meiosis I event.
(E) It has half the chromosomes but twice the DNA of the originating cell.

11. Jams, jellies, preserves, honey, and other foods with high sugar content hardly ever become contaminated by bacteria, even when the food containers are left open at room temperature. This is because bacteria that encounter such an environment _____.
(A) are unable to swim through these thick and viscous materials
(B) undergo death as a result of water loss from the cell
(C) are unable to metabolize the glucose or fructose, and thus starve to death
(D) are obligate anaerobes
(E) are unable to reproduce then die eventually

12. Sympatric species _____.
(A) are more likely than allopatric species to display character displacement
(B) always show character displacement
(C) are less likely than allopatric species to display character displacement
(D) are unlikely to be competing
(E) are more likely than allopatric species to display character displacement and likely to be competing

13. The veins of leaves are _____.
I) composed of xylem and phloem
II) continuous with vascular bundles in the stem and roots
III) finely branched to be in close contact with photosynthesizing cell
(A) only I (B) only II (C) only III
(D) I and II (E) I, II, and III

14. To be useful to plants soil nitrogen must usually occur as:
(A) N_2 and NH_3 (B) NH_3 and NO_3^- (C) NO_3^- and N_2
(D) N_2 and NO_2 (E) NO_2 and NO_3^-

15. What major benefits do plants and mycorrhizal fungi receive from their symbiotic relationship?
(A) Fungi receive photosynthetic products in exchange for living in plant root nodules.
(B) Plants receive nitrogen and phosphorus, and fungi receive photosynthetic products.
(C) Plants receive enzymes, and fungi receive nitrogen and phosphorus.
(D) Plants receive increased root surface area, and fungi receive digestive enzymes.
(E) All of the above are false.

16. Which of the following statements about vitamins is **FALSE**?
(A) Thiamine is a coenzyme in removing CO_2 and relates to Beriberi.
(B) Folic acid is a component of coenzyme A and relates to birth defect.
(C) Ascorbic acid is a coenzyme in collagen synthesis and relates to scurvy.
(D) Retinol is a component of visual pigments and relates to blindness.
(E) Tocopherol is an antioxidant and relates to nervous system degeneration.

17. Pollen from a plant with the S1S2 genotype is recognized and allowed to germinate on the stigma of the same plant with the S1S2 genotype. According to the S-system hypothesis, this indicates that the plant is _____.
(A) self-incompatible and must cross-pollinate
(B) self-incompatible and can self-pollinate
(C) self-compatible and must cross-pollinate
(D) self-compatible and can self-pollinate
(E) self-compatible and can self-pollinate or cross-pollinate

18. DNA methylation and histone acetylation are examples of _____.
(A) genetic mutation (B) epigenetic phenomena (C) translocation
(D) chromosomal rearrangements (E) gene degradation

19. Which of the following is in the correct order for one cycle of polymerase chain reaction (PCR)?
(A) Denature DNA; add fresh enzyme; anneal primers; add dNTPs; extend primers.
(B) Anneal primers; denature DNA; extend primers.
(C) Denature DNA; anneal primers; extend primers.
(D) Extend primers; anneal primers; denature DNA.
(E) Add dNTPs; add fresh enzyme; denature DNA.

20. Which of the following definition is **WRONG** for molecular clock?
(A) Paralogous genes are used.
(B) Constant mutation rate is supposed.
(C) Fossil record can be used to correct dating.
(D) Based on Neutral theory.
(E) The rate of molecular change should be regular like a clock.

21. If organisms a, b, and c belong to the same class but to different orders and if organisms c, d, and e belong to the same order but to different families, which of the following pairs of organisms would be expected to show the greatest degree of structural homology?
(A) a and d (B) b and c (C) b and d
(D) d and e (E) a and e

22. Which of the following plants has a dominant sporophyte generation and a seed, but no fruit?
(A) fern (B) pine tree (C) tulip
(D) lycophyte (E) moss

23. Which of the following statements about renin-angiotensin-aldosterone system (RAAS) is **FALSE**?
(A) Sensors in juxtaglomerular apparatus (JAG) detect decrease in pressure.
(B) JAG releases renin with decreased pressure.
(C) Renin cleaves angiotensinogen to produce angiotensin I.
(D) Angiotensin II stimulates the kidney to release aldosterone.
(E) Aldosterone increases blood volume by Na^+ and water reabsorption.

24. A biologist doing a long-term study on a wild spider population observes increased variation in silk thickness. Which of the following could the spider population be experiencing?
(A) directional selection (B) genetic drift (C) disruptive selection
(D) stabilizing selection (E) founder effect

25. Two species of frogs belonging to the same genus occasionally mate, but the embryos stop developing after a day and then die. These two frog species separate by _____.
(A) gametic isolation (B) reduced hybrid fertility (C) hybrid breakdown
(D) mechanical isolation (E) reduced hybrid viability

26. Which of the following characteristics tends to limit bryophytes and seedless vascular plants to habitats that are relatively moist?
(A) absence of cuticle
(B) presence of flagellated sperm
(C) presence of free-living, independent zygotes and early embryos
(D) presence of lignified vascular tissues
(E) presence of seeds and pollen

27. There are several stages about alternation of generations of ferns. Which order is **TRUE**?
(1) gametophyte, (2) sporophyte, (3) spores, (4) archegonia, (5) gametes.
(A) 32541 (B) 23145 (C) 32451
(D) 23541 (E) 32145

28. Compare with Monocots and Eudicots, which of the following statements is **FALSE**?
(A) A seed of Monocots has one cotyledon; that of Eudicots has two.
(B) Leaf vein of Monocots is usually parallel, but that of Eudicots is usually netlike.
(C) Vascular tissue of stems in Monocots is scattered, but that of Eudicots is usually arranged in ring.
(D) Pollen grain of Monocots has one opening; that of Eudicots has three openings.
(E) Floral organs usually in multiple of four in Monocots, but three in Eudicots.

29. Which structure is found in angiosperms but **NOT** gymnosperms?
(A) fruit (B) spores (C) seeds
(D) ovule (E) a tube that grows from the pollen to deliver sperm

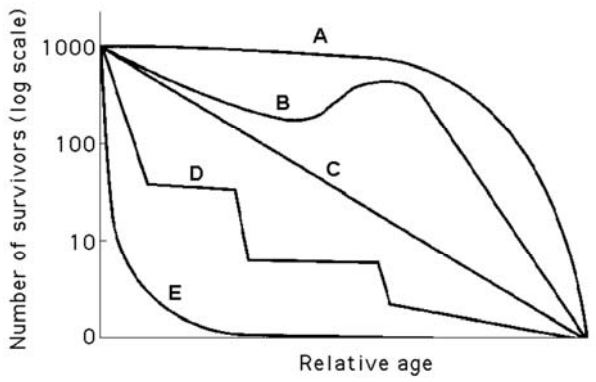
30. The heterokaryotic phase of a fungal life cycle is _____.
(A) a stage in which the hyphae contain only one type of haploid nucleus
(B) a stage in which hyphae contain two, genetically different, haploid nuclei
(C) a stage in which hyphae contain two, genetically different, diploid nuclei
(D) a stage that is diploid but functions as a gametophyte (like the body of an animal)
(E) a triploid stage formed by the fusion of a diploid nucleus with the haploid nucleus of a compatible hypha

31. Exercise and emergency reactions include _____.
(A) decreased activity in the sympathetic, and increased activity in the parasympathetic divisions
(B) increased activity in all parts of the peripheral nervous system
(C) increased activity in the sympathetic, and decreased activity in the parasympathetic divisions
(D) increased activity in the enteric nervous system
(E) reduced heart rate and blood pressure

32. Which of the following is an example of a commensalism?
(A) fungi residing in plant roots, such as endomycorrhizae
(B) rancher ants that protect aphids in exchange for sugar-rich honeydew
(C) bacteria fixing nitrogen in plants
(D) insects pollinate flowers
(E) cattle egrets eating insects stirred up by grazing bison

33. Which of the following is a greenhouse gas?
(A) water vapor (B) molecular oxygen (C) molecular nitrogen
(D) argon (E) carbon monoxide

34. In the figure below, which of the following survivorship curves most applies to humans living in developed countries?



(A) curve A (B) curve B (C) curve C
(D) curve D (E) curve E

35. _____ is formed in _____ during embryonic development. Which of the following statements is **FALSE**?
(A) Dorsal lip, frog (B) Primitive streak, sea urchin (C) Primitive streak, chick
(D) Epiblast, chick (E) Epiblast, human

36. Which of the following statements about fruit fly is **FALSE**?
(A) Spermatheca can be used to store sperm in male fly.
(B) Defective expression of *Hox* genes suppresses the embryonic development.
(C) The courtship behaviors include orienting, tapping and singing.
(D) Toll receptor leads to synthesis of antimicrobial peptides against fungi.
(E) *Drosophila melanogaster* has a diploid number of 8.

37. Which insect is classified incorrectly?
(A) mosquitoes - Diptera (B) butterflies - Lepidoptera (C) bees - Lepidoptera
(D) flies - Diptera (E) grasshoppers - Orthoptera

38. Which of the following statements about the reproductive cycles of human female is **FALSE**?
(A) Low level of estradiol inhibits the secretion of pituitary gonadotropins.
(B) High level of estradiol stimulates the secretion of pituitary gonadotropins.
(C) High level of estradiol and progesterone stimulates the secretion of pituitary gonadotropins.
(D) High level of LH (luteinizing hormone) stimulates ovulation.
(E) High level of estradiol and progesterone stimulates the maintenance of endometrium.

39. Which of the following statements about the extracellular matrix (ECM) is **FALSE**?
(A) Collagens are assembled into triple helix in the ER lumen.
(B) Glycosaminoglycans (GAGs) contain positively charged carbohydrates.
(C) Chondroitin sulfate is a GAG to be part of proteoglycan.
(D) Elastin is a protein capable of changing conformation.
(E) Fibronectin can directly bind with integrin.

40. Which of the following statements about the RNA processing is **FALSE**?
(A) Not all of the nucleotides in the mature mRNA can be translated into proteins.
(B) Spliceosomes are composed of proteins and snRNAs.
(C) Modified guanosine is required for the capping of pre-mRNA.
(D) Methylation is required for the capping of pre-mRNA.
(E) Poly(A) polymerase adds 50-200 more adenines at the stop codon.

41. Which of the following statements about cell junctions is **FALSE**?
(A) Actin filaments anchor desmosomes in the cytoplasm.
(B) Hemidesmosomes connect cells to extracellular matrix (ECM) via integrins.
(C) Integrin is a transmembrane protein with two nonidentical subunits.
(D) Cadherins are Ca^{2+}-dependent molecules to create cell-to-cell junctions.
(E) The connexons of gap junctions allow the passage of ions.

42. Which of the following statements about blood tissue is **FALSE**?
(A) The mature red blood cells contain nucleus in frog but not in human.
(B) Eosinophils with bilobed-nucleus can kill parasites.
(C) Lymphocytes with multilobed-nucleus are the most abundant leukocytes.
(D) Monocytes are phagocytes and develop into macrophages.
(E) Basophiles secret anticlotting factor called heparin at the site of injury.

43. Which of the following statements about gene cloning is **FALSE**?
(A) DNA with specific palindromic sequence can be cut by restriction enzymes.
(B) *Eco*RI, a restriction enzyme from *E. coli,* cut DNA into sticky ends.
(C) Gene of interest can be linked into plasmid with DNA polymerase.
(D) The plasmids are transformed into competent cells.
(E) Ions such as $CaCl_2$ affect whether or not a bacterium will be competent cells.

44. Which of the following statements about neurotransmitter is **FALSE**?
(A) Dopamine is derived from tyrosine and released by ventral tegmental area (VTA) neuron.
(B) Epinephrine derived from tryptophan is important for fight-or-flight reactions.
(C) Serotonin derived from tryptophan affect sleep and mood.
(D) Endorphin is a neuropeptide to mediate pain perception.
(E) Substance P is a neuropeptide to mediate pain perception.

45. Which of the following statements about drugs is **FALSE**?
(A) Taxol inhibits cancer cells by preventing microtubule depolymerization.
(B) Tamoxifen inhibits cancer cells by blocking the function of estrogen receptor.
(C) RU486 induces abortion by blocking the function of estrogen receptor.
(D) Erythromycin inhibits the growth of bacteria by blocking their ribosomes.
(E) Chloramphenicol inhibits the growth of bacteria by blocking their ribosomes.

46. Which of the following sugars contain ketone group?
(A) glyceraldehyde (B) ribose (C) glucose
(D) fructose (E) galactose

47. Which of the following proteins have quaternary structure?
I. Methionine II. Lysozyme III. Collagen IV. Hemoglobin
(A) I and II (B) III and IV (C) I, II, and IV (D) II, III, and IV (E) II and III

48. Endomembrane system includes following organelles, except _____.
(A) nuclear envelope (B) endoplasmic reticulum (ER) (C) Golgi apparatus
(D) mitochondria (E) lysosome

49. Which of following is **NOT** a second messenger in signal transduction?
(A) proton (B) cAMP (C) Ca^{2+}
(D) inositol triphosphate (IP_3) (E) diacylglycerol (DAG)

50. All of the enzymes catalyze reactions to produce NADH , $FADH_2$ or ATP in citric acid cycle, except _____.
(A) isocitrate dehydrogenase
(B) α-ketoglutarate dehydrogenase
(C) succinyl-CoA synthetase
(D) succinate dehydrogenase
(E) citrate synthetase

51. Which of the following molecule does **NOT** participate in oxidative phosphorylation?
(A) proton (B) Ca^{2+} (C) ubiquinone (Q)
(D) cytochrome *c* (cyt *c*) (E) ADP

52. Which of the following statements about cell cycle is **FALSE**?
(A) Cyclin is degraded during G1.
(B) Synthesis of cyclin begins in S phase.
(C) Cyclin combines with Cdk to produce maturation-promoting factor (MPF).
(D) MPF promotes mitosis by phosphorylating various proteins.
(E) MPF's activity peaks during prophase of M phase.

53. Which of the following statements about inherited disorders is **FALSE**?
(A) Cystic fibrosis, a recessive disease, is caused by the defect of Cl^- transporter.
(B) Tay-Sachs disease, a dominate disease, is caused by the defect in mitochondria.
(C) Phenylketonuria, a recessive disease, is caused by inability to metabolized phenylalanine.
(D) Huntingon's disease, a dominate disease, is a neuron degenerative disease.
(E) Sickle-cell disease caused by T to A substitution results in defect of hemoglobin.

54. Which of the following statements about bacterial replication fork is **FALSE**?
(A) Helicase breaks and unwinds parental DNA.
(B) Primase synthesizes DNA primers.
(C) DNA polymerase III synthesizes leading strand.
(D) DNA polymerase I removes the primers.
(E) DNA ligase joins the Okazaki fragments.

55. Which of the following statements about the molecules of appetite regulation is **FALSE**?
(A) Hormone ghrelin is secreted by stomach to trigger feelings of hunger.
(B) Hormone insulin is secreted by pancreas to suppress appetite by brain.
(C) Hormone leptin is secreted by adipose to suppress appetite.
(D) Hormone PYY is secreted by small intestine to suppress appetite.
(E) Hormone syndecan is secreted by hypothalamus to trigger appetite.

56. What is the order of the control of heart rhythm?
1. Signals are delayed at AV node. 2. Bundle branches pass signals to heart apex.
3. Signals from SA node spread. 4. Signals spread throughout ventricles.
(A) 3 → 4 → 2 → 1 (B) 4 → 1 → 3 → 2 (C) 3 → 1 → 2 → 4
(D) 2 → 1 → 4 → 3 (E) 2 → 3 → 4 → 1

57. What is the order of the nephron?
1. Thick segment of ascending limb. 2. Distal tubule. 3. Descending limb. 4. Glomerulus.
5. Thin segment of ascending limb. 6. Collecting duct. 7. Proximal tubule.
(A) 4 → 2 → 3 → 5 → 1 → 7 → 6
(B) 4 → 7 → 3 → 5 → 1 → 2 → 6
(C) 4 → 2 → 3 → 1 → 5 → 7 → 6
(D) 4 → 7 → 5 → 1 → 3 → 2 → 6
(E) 4 → 2 → 7 → 1 → 5 → 3 → 6

58. Which of the following statements about the regulation of skeletal muscle contraction is **FALSE**?
(A) Acetylcholine releases and triggers an action potential in muscle fiber.
(B) Action potential is propagated along plasma membrane and down T tubules.
(C) Action potential triggers Ca^{2+} release from sarcoplasmic reticulum (SR).
(D) Ca^{2+} bind to tropomyosin and release myosin-binding sites to initiate muscle contraction.
(E) Amyotrophic lateral sclerosis (ALS) is a disease of muscle fibers atrophy caused by motor neuron degeneration.

59. Which of the following statements about skeleton is **FALSE**?
(A) Nematodes use hydrostatic skeleton to move.
(B) The exoskeletons of insect contain chitin.
(C) The osteoblasts are bone-building cells.
(D) The osteoclasts are bone-resorbing cells.
(E) The joint between the head of ulna and the humerus is a pivot joint.

60. Which of the following statements about plant hormones is **FALSE**?
(A) Auxin (IAA) is produced by shoot apical meristems to stimulate stem elongation.
(B) Cytokinins are synthesized in roots to regulate cell division.
(C) Gibberellins (GA) are produced by meristems of apical buds to stimulate pollen development.
(D) Ethylene can be produced by most parts of the plant to promote ripening of fruits.
(E) Jasmonates are derived from cartenoid regulate floral development.

Ⅱ.【單選題】61-80 題，每題 2 分，共計 40 分。答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

61. Which of the following statements about eukaryotic transcription is **FALSE**?
(A) Transcription factors bind on the TATA box of promoters.
(B) RNA polymerase II unwinds the double strand DNA and synthesis mRNAs.
(C) MyoD is a transcription factor committing cells into skeletal muscle.
(D) The direct binding of enhancer with the promoter increases the rate of gene expression.
(E) The start point is the nucleotide where RNA synthesis actually begins.

62. Which of the following statements about protist is **FALSE**?
(A) *Entamoeba histolytica* moves by pseudopodia and causes intestinal illness.
(B) *Trypanosoma* moves by flagella and causes sleeping sickness.
(C) *Plasmodium* moves by cilia and causes malaria.
(D) *Paramecium* moves by cilia and the genetic variation results from conjugation.
(E) *Trichomonas* moves by flagella and causes sexually transmitted disease.

63. Which of the following statements is **FALSE**?
(A) The hilum was observed in the starch grains of potato under microscope.
(B) The liver cells of pig may contain more than one nucleus.
(C) The shape of pigment cells in the fish scale is irregular.
(D) The fat cells stained by Sudan dye turned into blue color.
(E) The composition of crystals in the plants can be $CaCO_3$ or Calcium oxalate.

64. Which of the following statements about RNA interference (RNAi) is **FALSE**?
(A) MicroRNAs (miRNAs) or short-interfering RNAs (siRNAs) interfere with the proper expression of mRNAs.
(B) Single-stranded pre-siRNA is cut by dicer and release typically 22bp RNA.
(C) Single-stranded siRNA associates with RISC protein and bind to target mRNA.
(D) High complementarity of siRNA and target mRNA result in mRNA degradation or translation inhibition.
(E) Low complementarity of siRNA and target mRNA result in mRNA degradation or translation inhibition.

65. Which of the following coding region of a mRNA can encode a peptide and end at stop codon?
(A) 5' ACGAUAAACUGAUCUAUUAG 3'
(B) 5' CACAUAUGAAAGACACCCUAA 3'
(C) 5' AAUAGCCAGUAGGCCGCUAG 3'
(D) 5' ACUUAGCGAACUCCACAAUG 3'
(E) 5' GGGACAUGCCCAGAUGACAC 3'

66. A farmer uses triazine herbicide to control pigweed in his field. For the first few years, the triazine works well and almost all the pigweed dies; but after several years, the farmer sees more and more pigweed. Which of these explanations best explains what happened?
(A) The herbicide company lost its triazine formula and started selling poor-quality triazine.
(B) Triazine-resistant pigweed has less-efficient photosynthesis metabolism.
(C) Natural selection caused the pigweed to mutate, creating a new triazine-resistant species.
(D) Triazine-resistant weeds were more likely to survive and reproduce.
(E) Disruptive selection caused the pigweed to produce a new triazine-resistant species.

67. You enjoy learning about history by traveling throughout North America studying gravestones. You notice that gravestones from 1900 and earlier usually host many types of lichens. But in one cemetery, lichens are entirely absent, even from old gravestones. Given what is known about lichens, the cemetery without lichens probably _____.
(A) has an unusually dry climate
(B) is subject to extremely cold winter temperatures
(C) gets a great deal of rain, which favors the growth of competing bacteria
(D) has a high population of fungi that parasitize lichens
(E) is close to a source of air pollution

68. The most immediate potential benefits of introducing genetically modified crops include _____.
I. creating crops that can grow on land previously unsuitable for agriculture
II. creating crops with better potential for biofuel production
III. creating crops with better nutritional attributes
IV. increasing crop yield
V. decreasing the mutation rate of certain genes

(A) III, IV, and V (B) II, III, and IV (C) I, II, and III
(D) I, II, III, and IV (E) I, II, III, IV, and V

69. Radish flowers may be red, purple, or white. A cross between a red-flowered plant and a white-flowered plant yields all-purple offspring. The part of the radish we eat may be oval or long, with long being the dominant trait. If true-breeding red long radishes are crossed with true-breeding white oval radishes, the F1 will be expected to be which of the following?
(A) purple and long (B) purple and oval (C) red and long
(D) white and long (E) red and oval

70. What is the most logical sequence of steps for splicing foreign DNA into a plasmid and inserting the plasmid into a bacterium?
I. Transform bacteria with a recombinant DNA molecule.
II. Cut the plasmid DNA using restriction enzymes (endonucleases).
III. Extract plasmid DNA from bacterial cells.
IV. Hydrogen-bond the plasmid DNA to nonplasmid DNA fragments.
V. Use ligase to seal plasmid DNA to nonplasmid DNA.
(A) III, II, IV, V, I (B) IV, V, I, II, III (C) II, III, V, IV, I
(D) III, IV, V, I, II (E) III, I, IV, V, II

71. The following table compares the % sequence homology of four different parts (two introns and two exons) of a gene that is found in five different eukaryotic species. The data reported for species A were obtained by comparing DNA from one member of species A to another member of species A.

Species	Intron I	Exon I	Intron VI	Exon V
A	100%	100%	100%	100%
B	99%	98%	82%	96%
C	99%	98%	89%	96%
D	99%	98%	92%	97%
E	99%	98%	80%	94%

Which of these four gene parts should allow the construction of the most accurate phylogenetic tree, assuming that this is the only part of the gene that has acted as a reliable molecular clock?
(A) Exon I (B) Exon V (C) Intron I
(D) Intron VI (E) Both Exon I and V

72. The tails of UCSD campus male dark-eyed juncos were, on average, 36% white, whereas the tails of male juncos from the original colonizing population averaged 40-45% white. If this observed trait difference were due to a difference in the original colonizing population, it would most likely be due to _____.
(A) a genetic bottleneck (B) a founder effect (C) gene flow between populations
(D) mutations in the UCSD population (E) stabilizing selection

73. The phenomenon of fusion is likely to occur when, after a period of geographic isolation, two populations meet again and _____.
(A) an increasing number of viable, fertile hybrids is produced over the course of the next one hundred generations
(B) an increasing number of infertile hybrids is produced over the course of the next one hundred generations
(C) no reproduction occurs in the hybrid zone
(D) a decreasing number of viable, fertile hybrids is produced over the course of the next one hundred generations
(E) fewer and fewer hybridization occurs

74. If two species are close competitors, and one species is experimentally removed from the community, the remaining species would be expected to _____.
(A) become the target of specialized parasites
(B) expand its realized niche
(C) change its fundamental niche
(D) decline in abundance
(E) unchange

75. Which of the following statements about bacterial gene regulation is **FALSE**?
(A) Tryptophan binds to activate repressor of *trp* operon.
(B) Allolactose is an inducer of *lac* operon.
(C) The product of *lac I* is the repressor of *lac* operon.
(D) Inactive repressor turns the repressible operon off.
(E) Catabolite activator protein (CAP) is activated by cAMP in *lac* operon.

76. Some molecular data place the giant panda in the bear family (Ursidae) but place the lesser panda in the raccoon family (Procyonidae). The morphological similarities of these two species must therefore be due to _____.
(A) inheritance of acquired characteristics
(B) sexual selection
(C) inheritance of shared derived characters
(D) convergent evolution
(E) punctuated equilibrium

77. Which of the following statements about the scientists and their contributions to the discovery of DNA as a genetic material as well as DNA's structure and function is **NOT CORRECT**?
(A) Frederick Griffith's study on two strains of *Streptococus pneumonia* led to the discovery that DNA is a genetic material.
(B) Alfred Hershey and Martha Chase's studies of the virus that infects bacteria provided experimental evidence that DNA, but not protein, is the genetic material of virus.
(C) Erwin Chargaff reported that the base composition of DNA varies between species, providing additional evidence that DNA is a genetic material.
(D) Rosalind Franklin produced the first X-ray diffraction image of DNA.
(E) James Watson and Francis Crick built the first double-helix model of DNA.

78. Which description about "innate immunity" is **NOT CORRECT**?
(A) Innate immunity is found in all animals.
(B) The great success of insects in habitats teeming with diverse microbes highlights the effectiveness of invertebrate innate immunity.
(C) Innate immune responses are distinct for different classes of pathogens.
(D) Recognition and response in innate immunity of mammalian occur with tremendous specificity.
(E) Each mammalian Toll-like receptor binds to fragments of molecules characteristic of a set of pathogens.

79. Which peptide can form disulfide bond and has high absorbance at 280 nm?
(A) APYNIK (B) KCMHYS (C) QWLTFS
(D) RVAGEF (E) CTHGPH

80. Which of the following statements about virus is **FALSE**?
(A) Papillomavirus is double-stranded DNA (dsDNA) virus that causes warts.
(B) Poxvirus is dsDNA virus that causes smallpox.
(C) Coronavirus is single-stranded RNA (ssRNA) virus that causes SARS.
(D) Filovirus is ssRNA virus that causes Ebola.
(E) Paramyxovirus is ssRNA virus that causes hepatitis C.

高雄醫學大學 104 學年度學士後醫學系招生考試試題

科目:有機化學　　考試時間: 80 分鐘

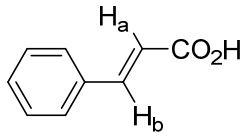
說明:一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。
二、試題及答案卡必須繳回，不得攜出試場。

Choose one best answer for the following questions

【單選題】每題 1 分，共計 60 分，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

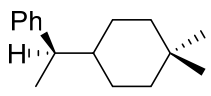
1. Which of the following reagent(s) could be used to oxidize primary alcohol to aldehyde?
I. Pyridium chlorochromate (PCC)　II. 1. $(COCl)_2$, DMSO; 2. Et_3N　III. Dess-Martin periodinane
(A) I　(B) II　(C) III　(D) I and II　(E) All of the above

2. What is the coupling constant (*J* value) between H_a and H_b in the following compound?

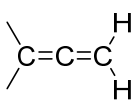


(A) 0~5 Hz　(B) 6~12 Hz　(C) 11~18 Hz　(D) 20~25 Hz　(E) None of the above

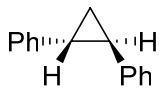
3. Which of the following structures is chiral?



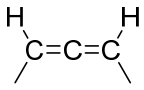
I



II

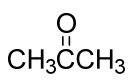
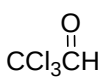
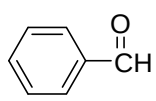
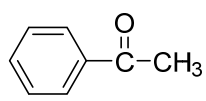


III



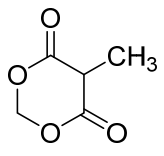
IV

(A) I and III　(B) II and IV　(C) I, III and IV　(D) I and IV　(E) III and IV

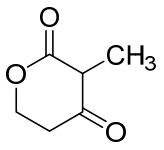
4. Which of the following carbonyl compounds has the **largest** equilibrium constant for the addition of water?
(A)  　(B)  　(C)  　(D)  　(E) 

5. The Hell-Volhard-Zelinsky reaction involves:
(A) the α-bromination of carboxylic acids　(B) the α-bromination of ketones
(C) the bromination of alcohols　(D) the oxidation of aldehydes to acids
(E) None of the above

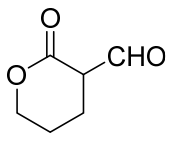
6. Which compound has the **lowest** pKa?



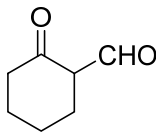
I



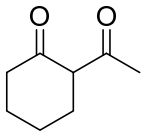
II



III



IV

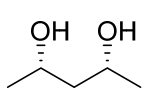


V

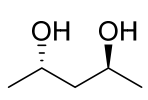
(A) I　(B) II　(C) III　(D) IV　(E) V

7. What is the **major** product, when 0.10 mol of $ICH_2CH_2CH_2CH_2Cl$ reacts with 0.10 mol of $NaOCH_3$ in CH_3OH at 40 °C ?
(A) $CH_3OCH_2CH_2CH_2CH_2Cl$　(B) $CH_3OCH_2CH_2CH_2CH_2I$　(C) $CH_3OCH_2CH_2CH_2CH_2OCH_3$
(D) $CH_2{=}CHCH_2CH_2Cl$　(E) $CH_2{=}CHCH_2CH_2I$

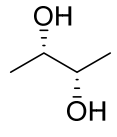
8. Which of the following is a **meso** compound?



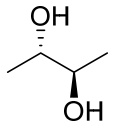
I



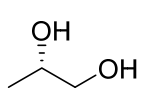
II



III



IV



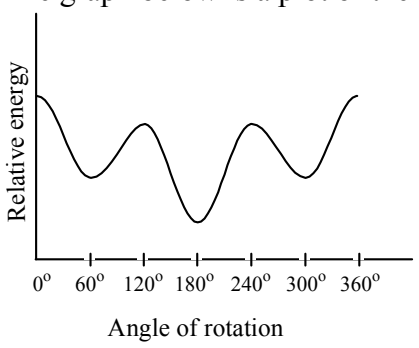
V

(A) I and III　(B) II and IV　(C) I and IV　(D) II and III　(E) I, IV and V

9. Which cycloalkane has the **lowest** heat of combustion per CH_2 group?
(A) Cyclopropane　(B) Cyclobutane　(C) Cyclopentane　(D) Cyclohexane　(E) Cycloheptane

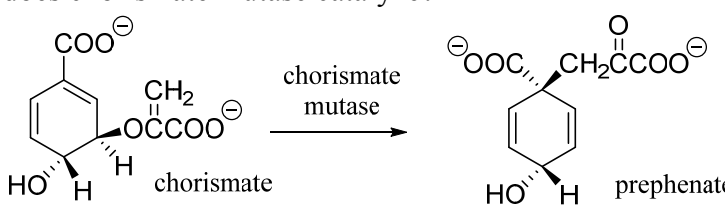
10. How many alkanes of formula C_7H_{16} possess a quaternary carbon atom?
(A) 1　(B) 2　(C) 3　(D) 4　(E) 5

11. The graph below is a plot of the relative energies of the various conformations, please predict the expected item?



(A) 2-Chloropropane (B) 1,3-Dichloropropane (C) 2-Methylpropane
(D) Butane (C1-C2 rotation) (E) Butane (C2-C3 rotation)

12. Chorismate mutase is an enzyme that catalyzes a pericyclic reaction that forms prephenate. What kind of a pericyclic reaction does chorismate mutase catalyze?

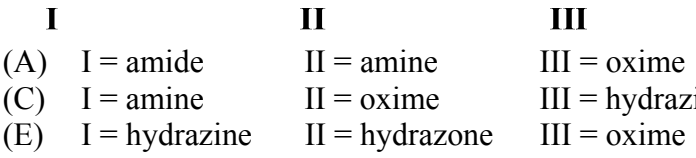


(A) an ene reaction (B) an electrocyclic reaction (C) a sigmatropic rearrangement
(D) a cycloaddition reaction (E) None of the above

13. The C_7 compound which gives 3 signals in the broadband proton-decoupled ^{13}C spectrum could be:
(A) Heptane (B) 2-Methylhexane (C) 3,3-Dimethylpentane
(D) 2,4-Dimethylpentane (E) 2,2,3-Trimethylbutane

14. Select the structure of a compound C_6H_{14} with a base peak at *m*/*z* 43.
(A) $CH_3CH_2CH_2CH_2CH_2CH_3$ (B) $(CH_3CH_2)_2CHCH_3$ (C) $(CH_3)_3CCH_2CH_3$
(D) $(CH_3)_2CHCH(CH_3)_2$ (E) None of the above

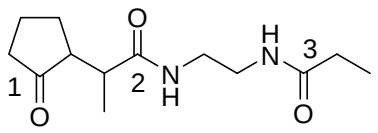
15. What is the **correct** assignment of the names of the functional groups in the following nitrogen-containing compounds?



I **II** **III**

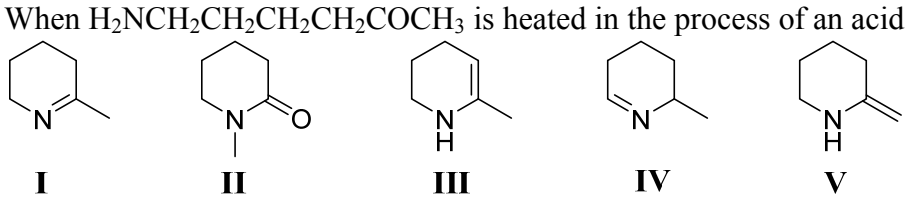
(A)	I = amide	II = amine	III = oxime	(B) I = imine	II = oxime	III = hydrazone
(C)	I = amine	II = oxime	III = hydrazine	(D) I = imine	II = hydrazone	III = amine
(E)	I = hydrazine	II = hydrazone	III = oxime			

16. Which sequence ranks the following carbonyl compounds in order of **increasing** rate of nucleophilic addition?



(A) 2 < 3 < 1 (B) 3 < 2 < 1 (C) 2 < 1 < 3 (D) 1 < 3 < 2 (E) 1 < 2 < 3

17. When $H_2NCH_2CH_2CH_2CH_2COCH_3$ is heated in the process of an acid catalyst, a reaction occurs. The **major** product is:



I **II** **III** **IV** **V**

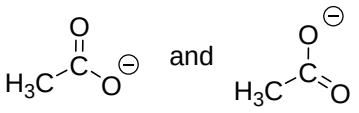
(A) I (B) II (C) III (D) IV (E) V

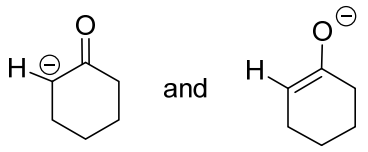
18. *p*-Methoxybenzaldehyde can be prepared from anisole using the Gatterman-Koch formylation. What mixture of reagents is necessary for this process?
(A) CO, HCl, $AlCl_3$, CuCl (B) CO, SO_3, H_2SO_4 (C) CO_2, HCl, $AlCl_3$
(D) CO_2, SO_3, H_2SO_4 (E) CO_2, HNO_3, H_2SO_4

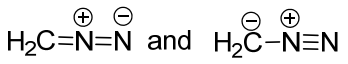
19. Which of the following carbonyl compounds may be made from 1,3-dithiane?
I. Methyl vinyl ketone II. 2-Pentanone III. 3,3-Dimethyl-2-butanone IV. 2-Phenylethanal
(A) I and IV (B) II only (C) II and III (D) II and IV (E) III and IV

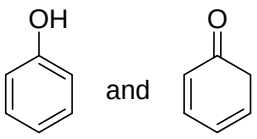
20. Predict the compound from the spectral data given. $C_9H_{10}O_2$: ^{13}C NMR, δ 18.06 (quartet), 45.40 (doublet), 127.32 (doublet), 127.55 (doublet), 128.61 (doublet), 139.70 (singlet), 180.98 (singlet); IR, broad 3500-2800, 1708 cm^{-1}
(A) 3-Phenylproponic acid (B) 2-Phenylproponic acid (C) 2-(4-Methylphenyl)acetic acid
(D) 2-(3-Methylphenyl)acetic acid (E) 2-(2-Methylphenyl)acetic acid

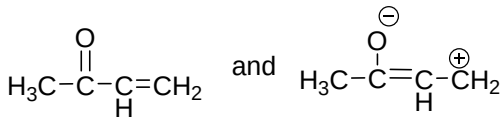
21. Which of the following pairs of structures are **not** resonance forms of the same compounds?

(A)  and

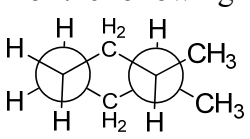
(B)  and

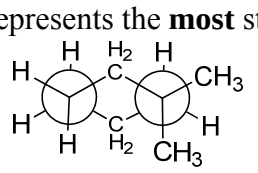
(C) 

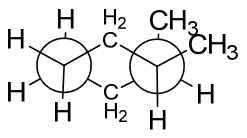
(D)  and

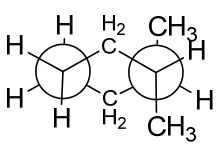
(E) 

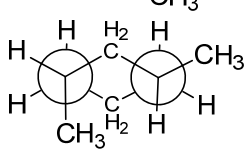
22. Which of the following Newman projection represents the **most** stable *trans*-1,2-dimethylcyclohexane?

(A) 

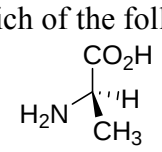
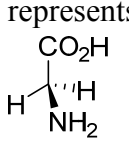
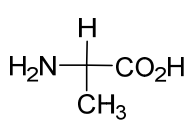
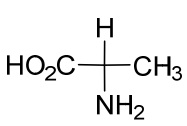
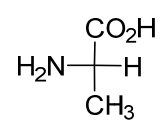
(B) 

(C) 

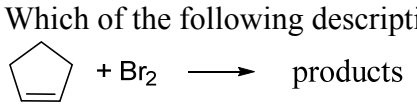
(D) 

(E) 

23. Which of the following structure represents (*S*)-L-alanine?

(A)  (B)  (C)  (D)  (E) 

24. Which of the following description(s) is(are) **true** for the following reaction?



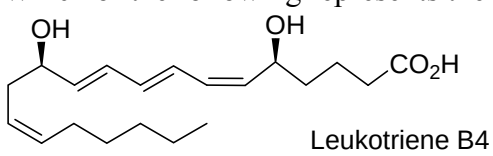
I: the solution of the products is optically active
II: the products have stereocenters
III: the products are meso compounds
IV: the products are racemic mixture
V: the reaction is enantioselective

(A) V only (B) I and II (C) III and IV (D) II and V (E) II and IV

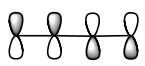
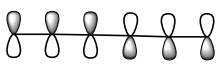
25. Disulfide linkages in proteins come from between:

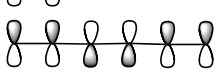
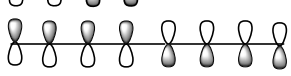
(A) two methionine residues
(B) two cysteine residues
(C) a cysteine residue and a methionine residue
(D) a threonine residue and a cysteine residue
(E) a methionine residue and a threonine residue

26. Which of the following represents the HOMO for the conjugated system in Leukotriene B4?

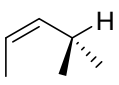
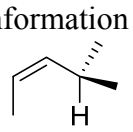
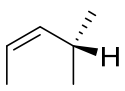


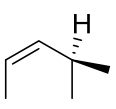
Leukotriene B4

(A)  (B)  (C) 

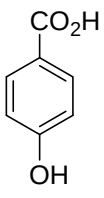
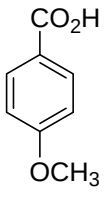
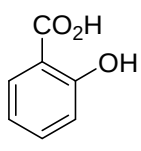
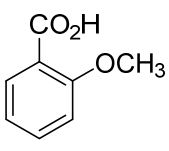
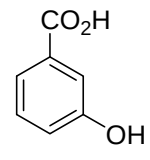
(D)  (E) 

27. Which of the following is the **most** stable conformation for *cis*-4-methyl-2-pentene?

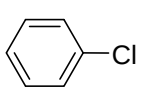
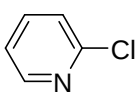
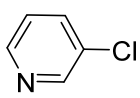
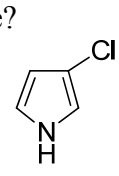
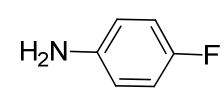
(A)  (B)  (C) 

(D)  (E) All of the above

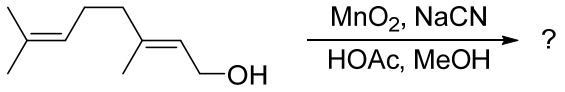
28. Which of the following acids has the **lowest** p*K*a value?

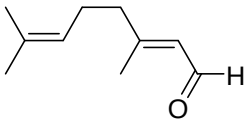
(A)  (B)  (C)  (D)  (E) 

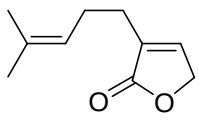
29. Which compound would undergo S_NAr reaction **most** rapidly with sodium methoxide?

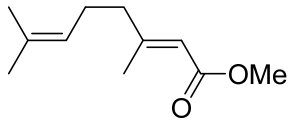
(A)  (B)  (C)  (D)  (E) 

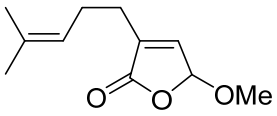
30. Which is the **major** product of the following reaction?



(A) 

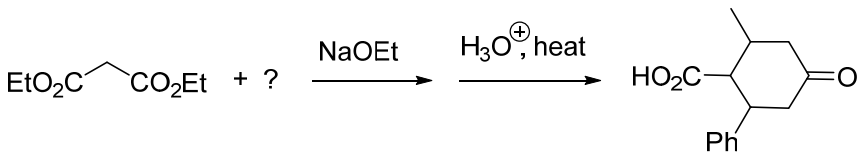
(B) 

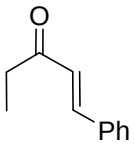
(C) 

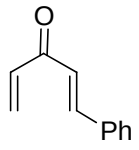
(D) 

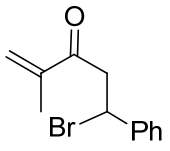
(E) None of the above

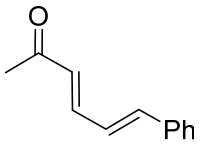
31. Provide the structure of the **missing** starting material to complete the reaction.

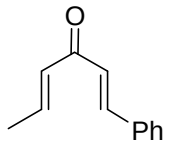


(A) 

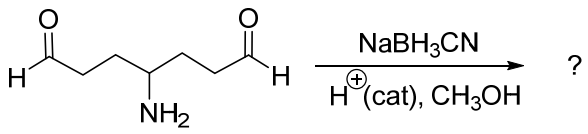
(B) 

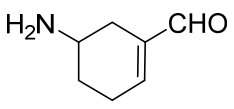
(C) 

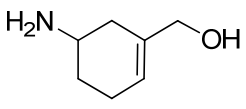
(D) 

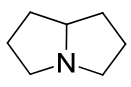
(E) 

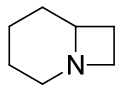
32. Which is the **major** product of the following reaction?

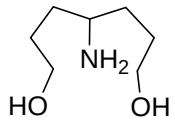


(A) 

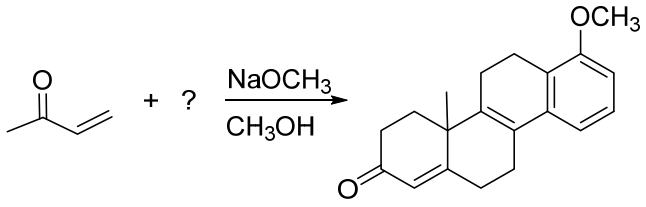
(B) 

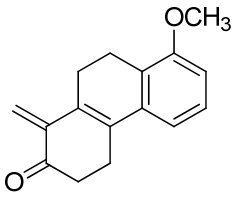
(C) 

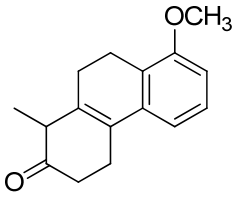
(D) 

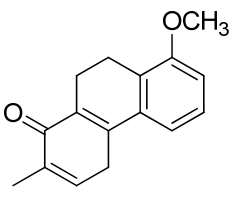
(E) 

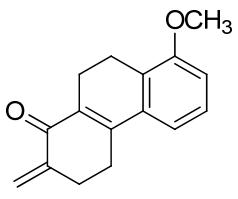
33. Provide the structure of the **missing** starting material to complete the reaction.

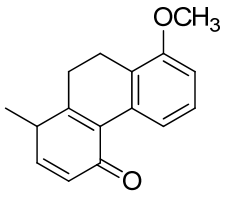


(A) 

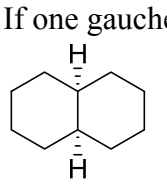
(B) 

(C) 

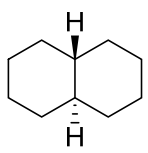
(D) 

(E) 

34. If one gauche interaction is 0.9 kcal/mol, what is the energy difference between *cis*-decalin and *trans*-decalin?



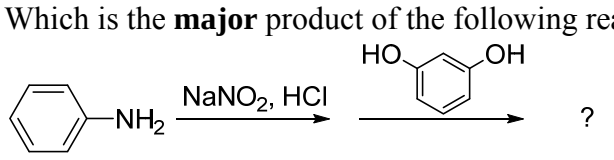
cis-decalin

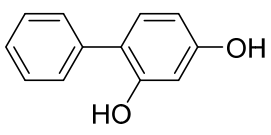


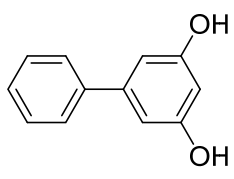
trans-decalin

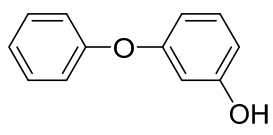
(A) 0.9 kcal/mol (B) 1.8 kcal/mol (C) 2.7 kcal/mol (D) 3.6 kcal/mol (E) 4.5 kcal/mol

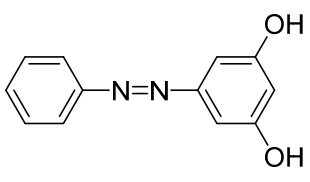
35. Which is the **major** product of the following reaction?

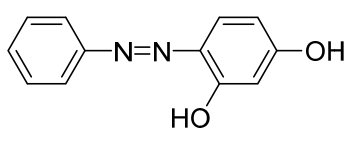


(A) 

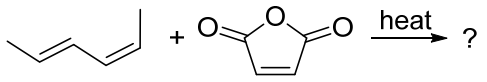
(B) 

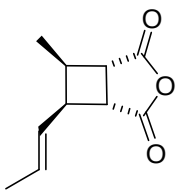
(C) 

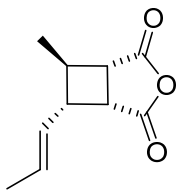
(D) 

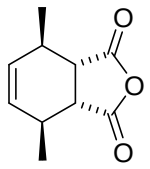
(E) 

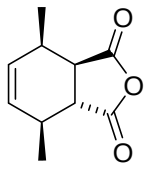
36. Which is the **major** product of the following reaction?

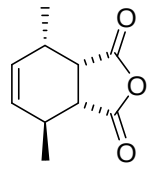


(A) 

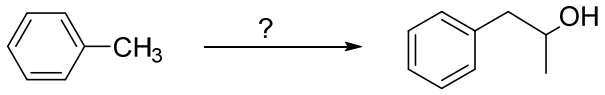
(B) 

(C) 

(D) 

(E) 

37. Provide the reagents to accomplish the synthesis shown below.



(A) 1. Br_2, $FeBr_3$ 2. Mg, THF 3. ethylene oxide, then $H_3O^{\oplus}$

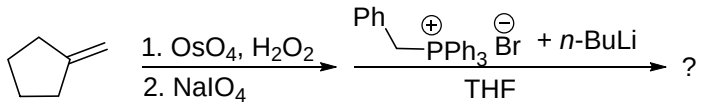
(B) 1. $KMnO_4$, $HO^{\ominus}$ 2. EtMgBr, ether 3. $H_3O^{\oplus}$

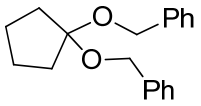
(C) 1. Br_2, $FeBr_3$ 2. Mg, THF 3. CO_2, then $H_3O^{\oplus}$

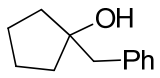
(D) 1. Br_2, hν 2. NaCN 3. $H_3O^{\oplus}$, heat

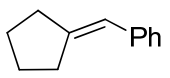
(E) 1. Br_2, hν 2. Mg, THF 3. CH_3CHO, then $H_3O^{\oplus}$

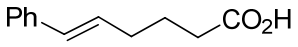
38. Which is the **major** product of the following reaction sequence?

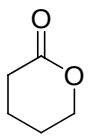


(A) 

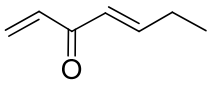
(B) 

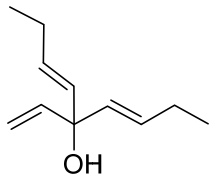
(C) 

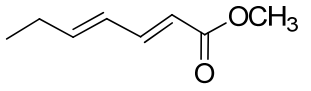
(D) 

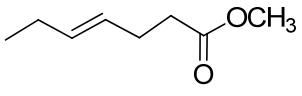
(E) 

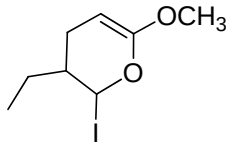
39. Which is the **major** product of the following reaction?

(A) 

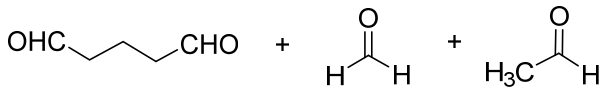
(B) 

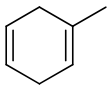
(C) 

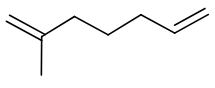
(D) 

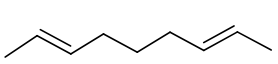
(E) 

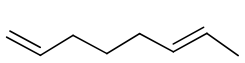
40. The following products were obtained from the oxidative cleavage of a diene. What is the structure of the diene?

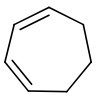


(A) 

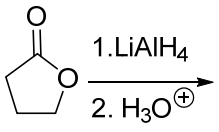
(B) 

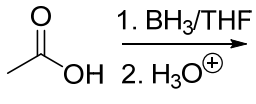
(C) 

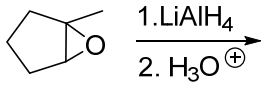
(D) 

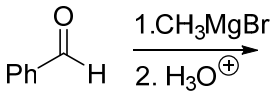
(E) 

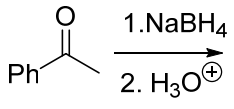
41. Which of the following reactions would give a tertiary alcohol as a product?

(A) 

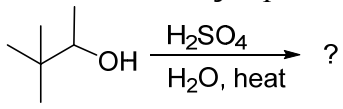
(B) 

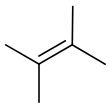
(C) 

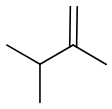
(D) 

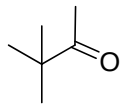
(E) 

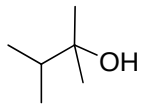
42. Which is the **major** product of the following reaction?

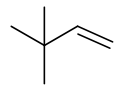


(A) 

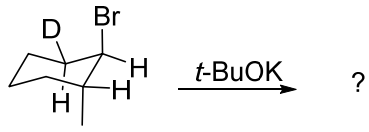
(B) 

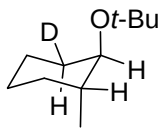
(C) 

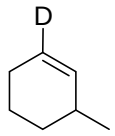
(D) 

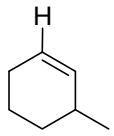
(E) 

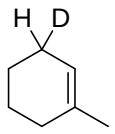
43. Which is the **major** product of the following reaction?

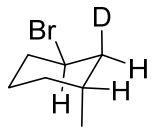


(A) 

(B) 

(C) 

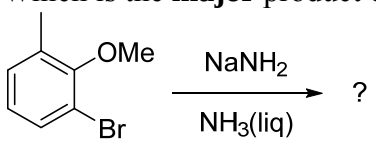
(D) 

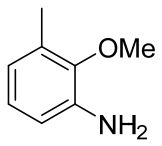
(E) 

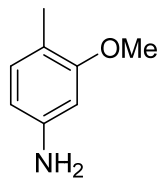
44. How to convert bromocyclohexane to *trans*-cyclohexane-1,2-diol?

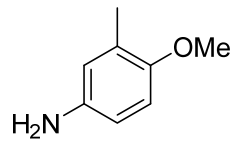
(A) 1. H_2SO_4, heat 2. MCPBA, then $H_3O^{\oplus}$
(B) 1. H_2SO_4, heat 2. $KMnO_4$, $HO^{\ominus}$
(C) 1. $NaOCH_3$ 2. O_3 then Me_2S
(D) 1. *t*-BuOK 2. MCPBA, then $H_3O^{\oplus}$
(E) 1. $NaOCH_3$ 2. H_2, Pd/C

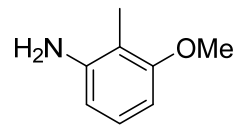
45. Which is the **major** product of the following reaction?



I 

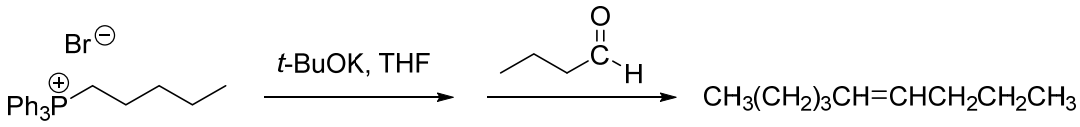
II 

III 

IV 

(A) I and II (B) I and III (C) II and III (D) I and IV (E) II and IV

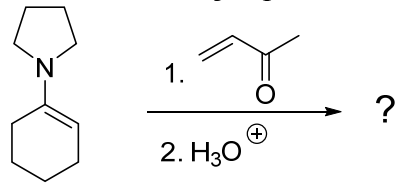
46. Which of the following statement(s) is(are) **true** for the following reaction?

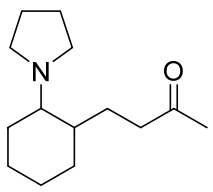


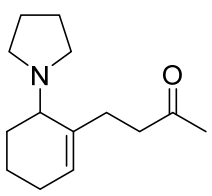
I. This reaction shows high (*Z*)-alkene selectivity.
II. When *n*-BuLi and Et_2O were used as the base and solvent, the selectivity decreases.
III. This reaction is under kinetic-controlled.

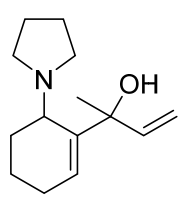
(A) I (B) II (C) III (D) I and III (E) All of the above

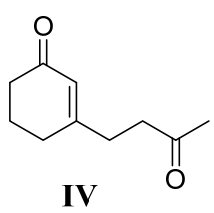
47. Which is the **major** product of the following reaction?

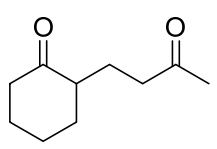


I 

II 

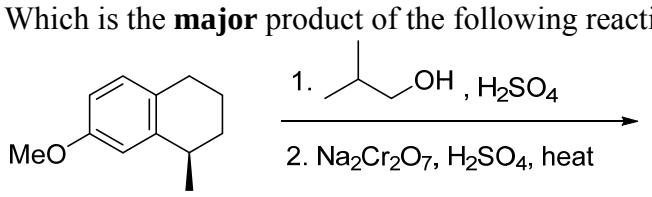
III 

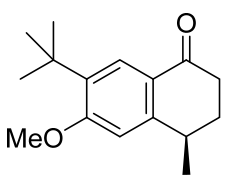
IV 

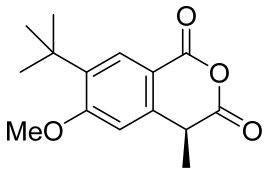
V 

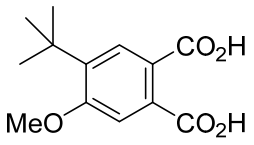
(A) I (B) II (C) III (D) IV (E) V

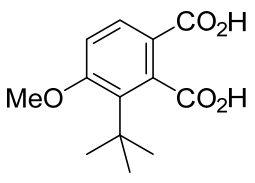
48. Which is the **major** product of the following reaction?

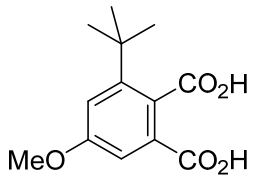


I 

II 

III 

IV 

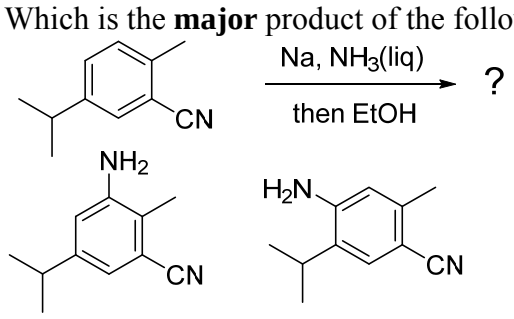
V 

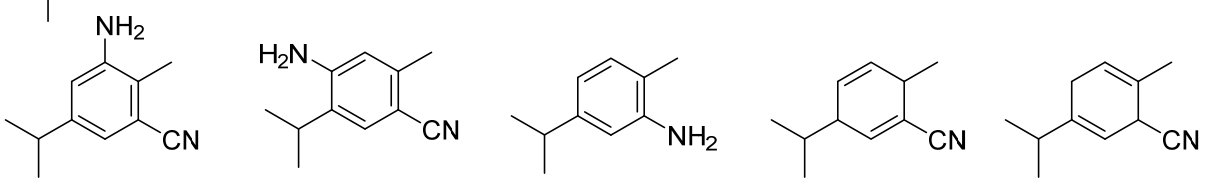
(A) I (B) II (C) III (D) IV (E) V

49. Which of the following synthetic procedures would be employed most effectively to transform ethanol into ethyl propyl ether?

(A) 1. Ethanol, HBr 2. Mg, ether, then $H_3O^{\oplus}$ 3. NaH, then CH_3CH_2Br
(B) 1. Ethanol, HBr 2. Mg, ether, then HCHO, then $H_3O^{\oplus}$ 3. NaH, then CH_3CH_2Br
(C) 1. Ethanol 2. $CH_3CH_2CH_2OH$ 3. H_2SO_4, 140 °C
(D) 1. Ethanol, NaH 2. HCHO, then $H_3O^{\oplus}$ 3. HBr, then Mg, ether, then $CH_3CH_2CH_2Br$
(E) 1. Ethanol 2. H_2SO_4, 180 °C 3. $CH_3CH_2CH_2Br$

50. Which is the **major** product of the following reaction?

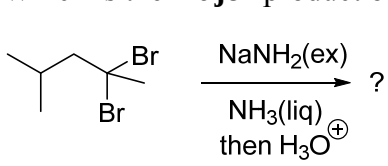


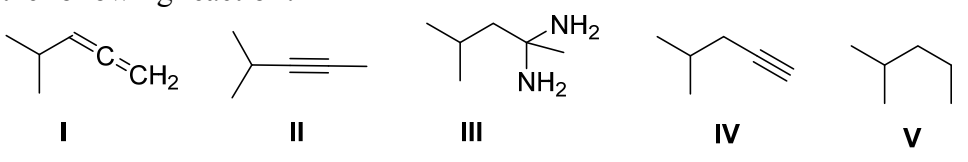


I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

51. Which is the **major** product of the following reaction?

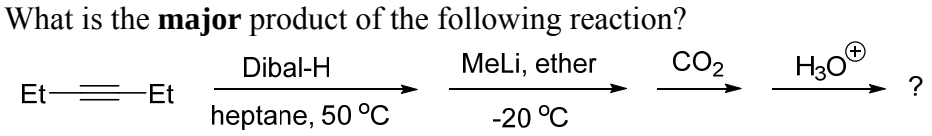


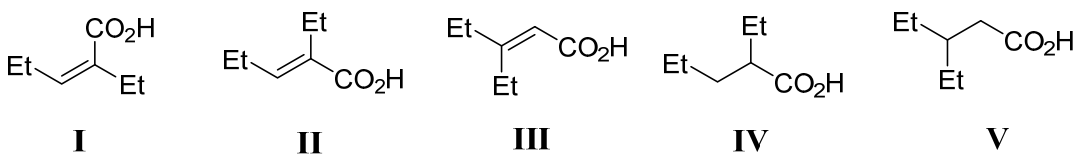


I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

52. What is the **major** product of the following reaction?

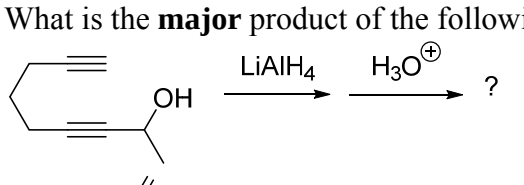


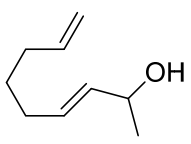


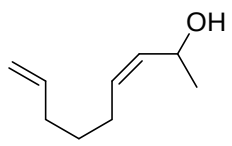
I **II** **III** **IV** **V**

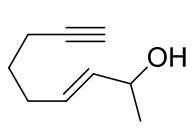
(A) I (B) II (C) III (D) IV (E) V

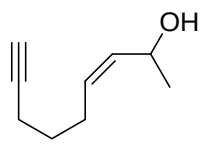
53. What is the **major** product of the following reaction?

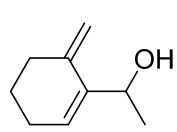


(A) 

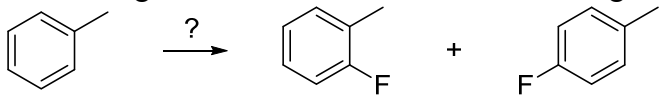
(B) 

(C) 

(D) 

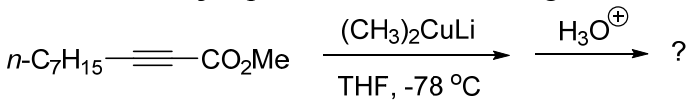
(E) 

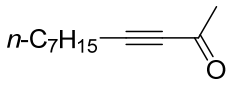
54. Which reagent is **most** suitable for the following transformation?

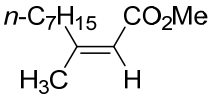


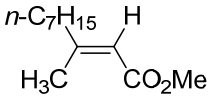
(A) CuF (B) F-TEDA-BF_4 (C) $AgSbF_6$ (D) HBF_4 (E) *n*-Bu_4NF

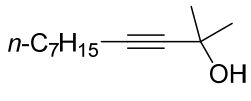
55. What is the **major** product of the following reaction?



(A) 

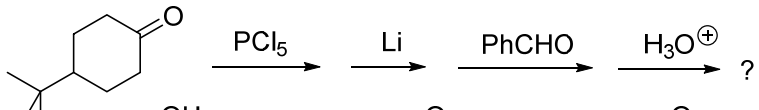
(B) 

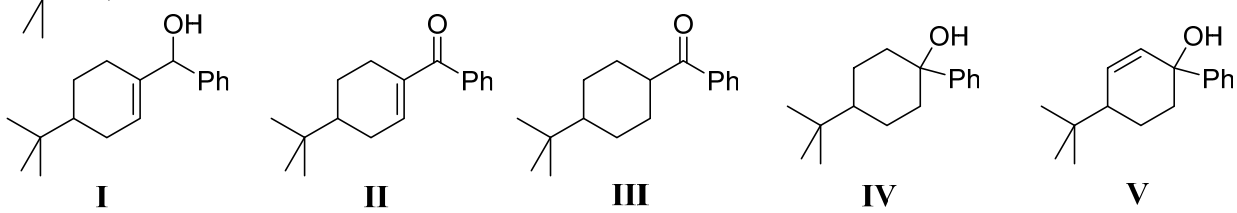
(C) 

(D) 

(E) None of the above

56. What is the **major** product of the following reaction?

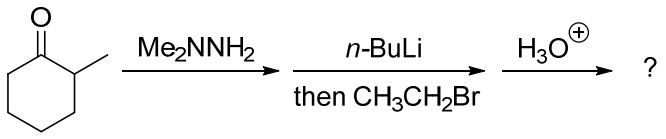


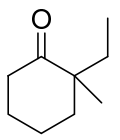


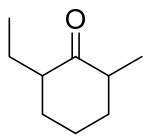
I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

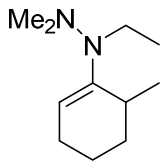
57. What is the **major** product of the following reaction?



(A) 

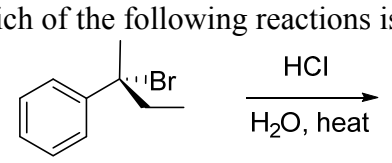
(B) 

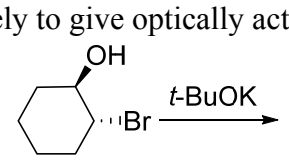
(C) 

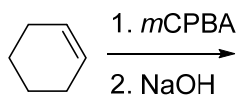
(D) 

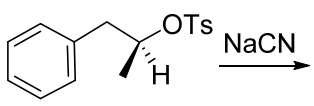
(E) None of the above

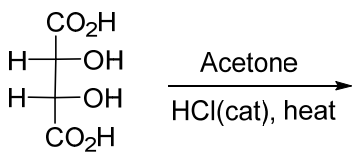
58. Which of the following reactions is **most** likely to give optically active products?

(A) 

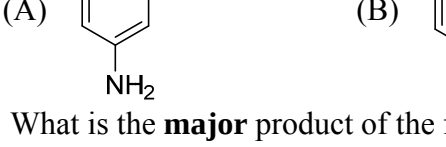
(B) 

(C) 

(D) 

(E) 

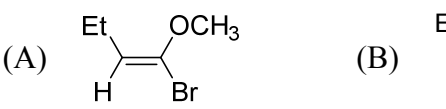
59. What reagent(s) can be used for the following transformation?



I. $KMnO_4$ II. SeO_2 III. Br_2, DMSO IV. NaOCl, H_2O

(A) I (B) II (C) III (D) IV (E) II and III

60. What reagent(s) can be used for the following transformation?



I. OsO_4 II. CH_3CO_3H, H_2O III. I_2, CH_3CO_2Ag, CH_3CO_2Ag, H_2O

(A) I (B) II (C) III (D) I and II (E) I and III

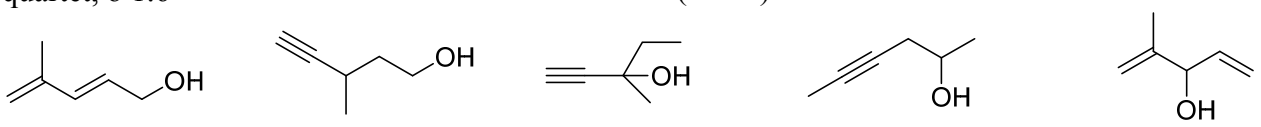
【單選題】每題 2 分，共計 40 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

61. What sequence of reagents is needed to convert *t*-butylbenzene into 1-bromo-2-(*t*-butyl)benzene?
I. Dilute H_2SO_4, heat II. $NaNO_2$, HCl III. Br_2, $FeBr_3$, heat IV. Fuming H_2SO_4, heat V. HBr, CuBr, heat

(A) IV → II → V (B) I → III → II (C) II → III → V (D) III → V → I (E) IV → III → I

62. Determine the **most** likely structure for a compound ($C_6H_{10}O$) which is found to decolorize bromine in carbon tetrachloride. Its spectral data is as follows:

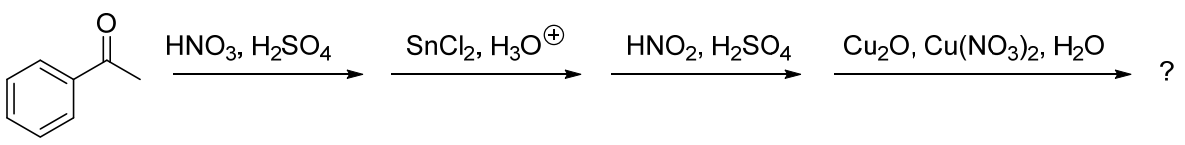
^{1}H-NMR		IR
triplet, δ 1.0	singlet, δ 2.4	2200 cm^{-1} (sharp)
singlet, δ 1.4	singlet, δ 3.4	3300 cm^{-1} (sharp)
quartet, δ 1.6		3500 cm^{-1} (broad)

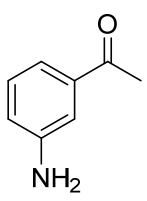


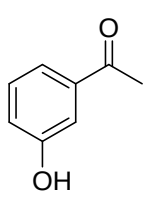
I **II** **III** **IV** **V**

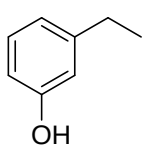
(A) I (B) II (C) III (D) IV (E) V

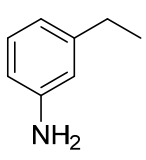
63. What is the **major** product of the following reaction?

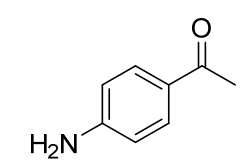


(A) 

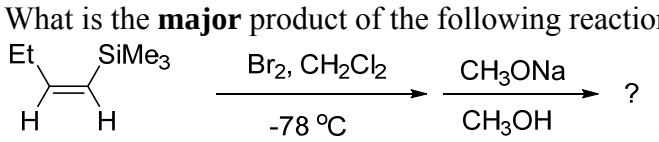
(B) 

(C) 

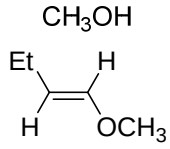
(D) 

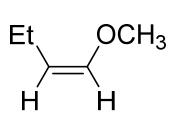
(E) 

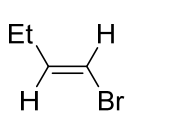
64. What is the **major** product of the following reaction?

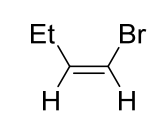


(A)

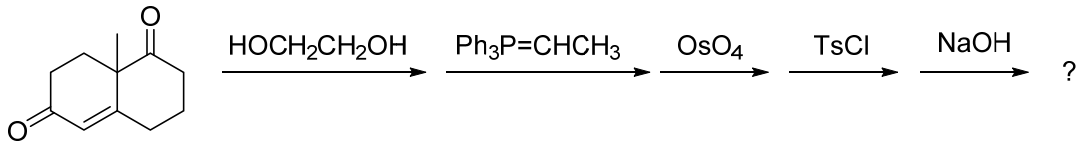
(B) 

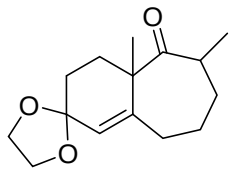
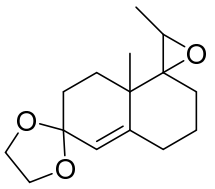
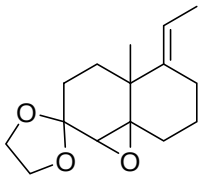
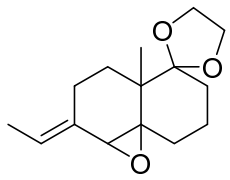
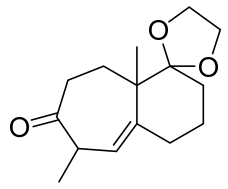
(C) 

(D) 

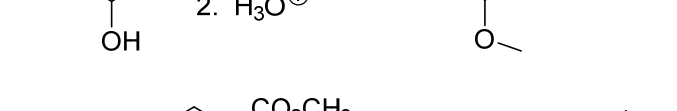
(E) 

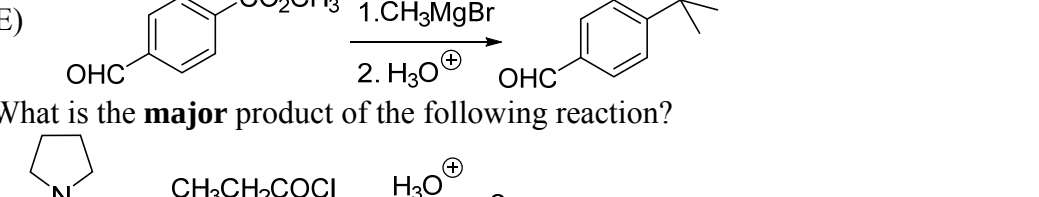
65. What is the **major** product of the following reactions?



(A)  (B)  (C)  (D)  (E) 

66. What is the **major** product of the following reactions?

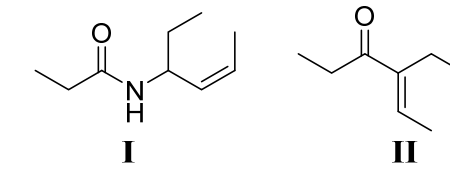




I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

67. Which reaction sequence is required to accomplish the following transformation?



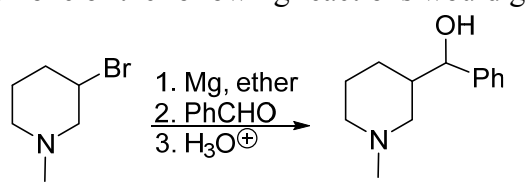
(A) 1. $LiAlH_4$ 2. $H_3O^{\oplus}$ 3. NaH, then CH_3I
(B) 1. H_2NNH_2, KOH, 120 °C 2. H_2, Pd/C 3. NaH, then CH_3I
(C) 1. $HOCH_2CH_2OH$, $H_3O^{\oplus}$ 2. $LiAlH_4$ 3. NaH, then CH_3I, then $H_3O^{\oplus}$
(D) 1. $HOCH_2CH_2OH$, $H_3O^{\oplus}$ 2. H_2NNH_2, KOH, 120 °C 3. H_2, Pd/C, $H_3O^{\oplus}$
(E) 1. $NaNH_2$, CH_3I 2. $LiAlH_4$ 3. H_2, Pd/C, $H_3O^{\oplus}$

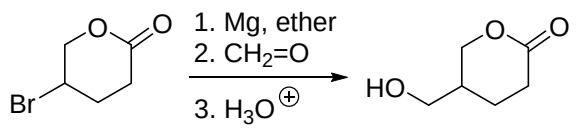
68. Which reaction sequence is required to accomplish the following transformation?

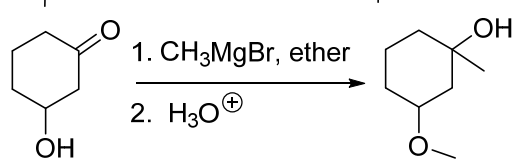
I. heat II. NaOH, heat, then HCl, H_2O III. NaOH IV. $CH_3COCH_2CO_2Et$, EtONa

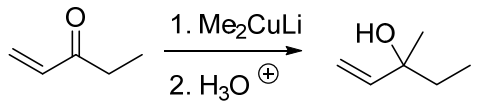
(A) I → II → III → IV (B) IV → II → I → III (C) III → VI → II → I
(D) II → IV → III → I (E) None of the above

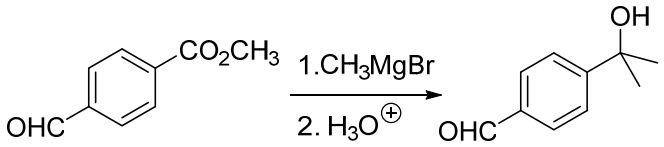
69. Which one of the following reactions would give the product as it is planned?

(A) 

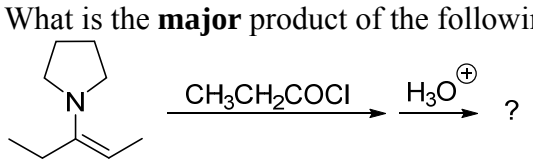
(B) 

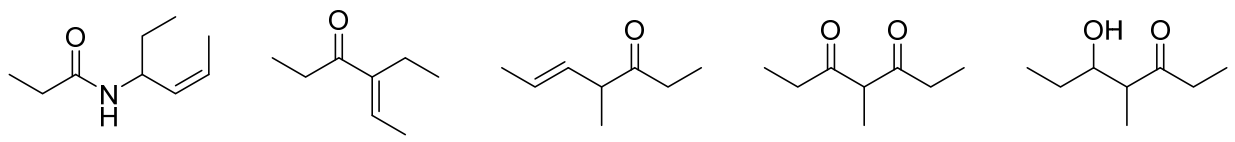
(C) 

(D) 

(E) 

70. What is the **major** product of the following reaction?

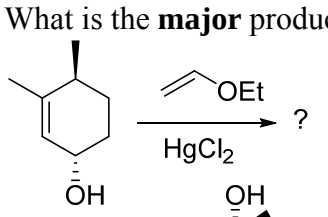


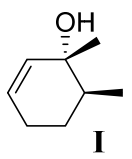


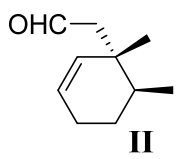
I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

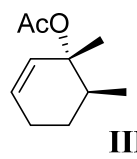
71. What is the **major** product of the following reaction?



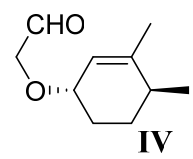

I



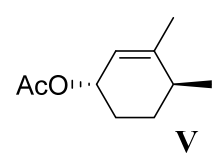
II



III



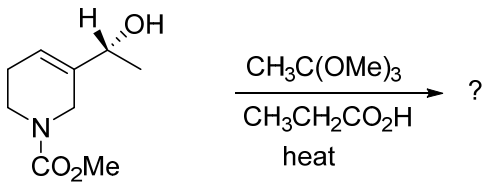
IV



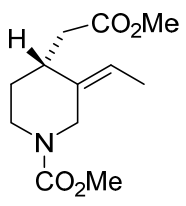
V

(A) I (B) II (C) III (D) IV (E) V

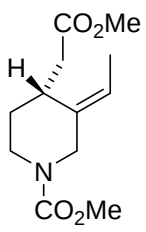
72. What is the **major** product of the following reaction?



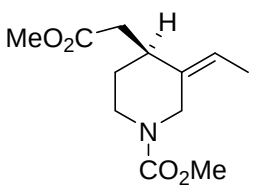
(A)



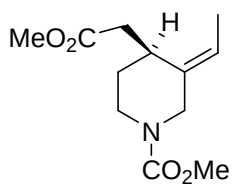
(B)



(C)

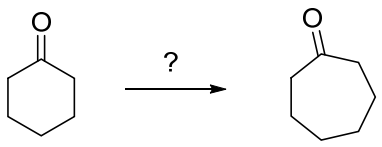


(D)



(E) None of the above

73. Which of the following series of synthetic steps could be used to carry out the transformation shown below?

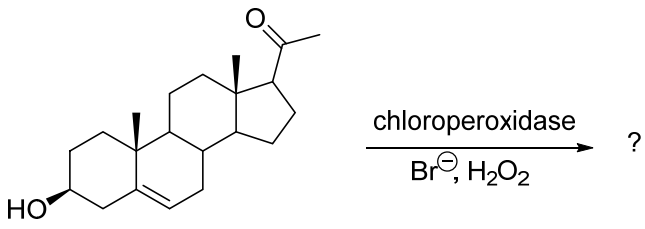


I. H_2, Pt/C II. B_2H_6 III. $NaNO_2$, $H_3O^{\oplus}$ IV. CH_3NO_2, KOH V. H_2O_2, NaOH VI. PCC

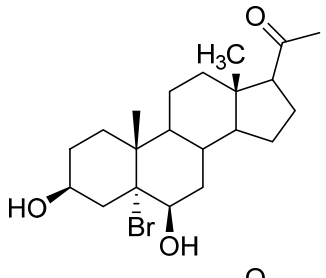
(A) I → II → V (B) IV → I → III (C) III → VI → V

(D) II → V → III (E) None of the above

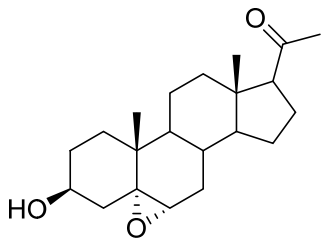
74. What is the **major** product of the following reaction?



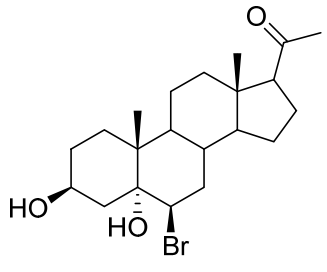
(A)



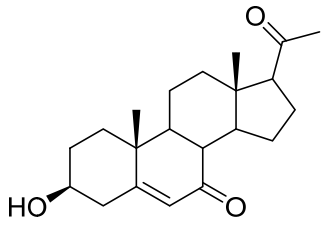
(B)



(C)

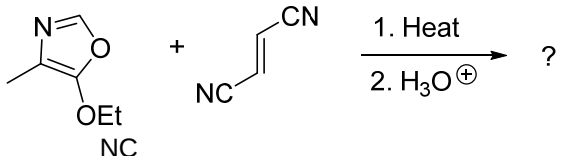


(D)

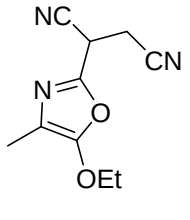


(E) None of the above

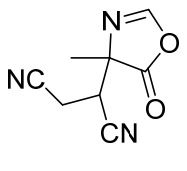
75. What is the **major** product of the following reaction?



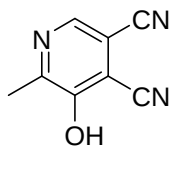
(A)



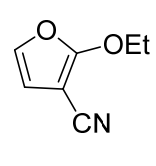
(B)



(C)

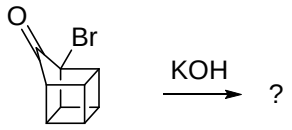


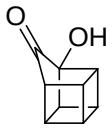
(D)

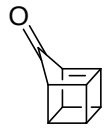


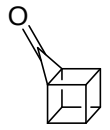
(E) None of the above

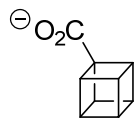
76. What is the **major** product of the following reaction?



(A) 

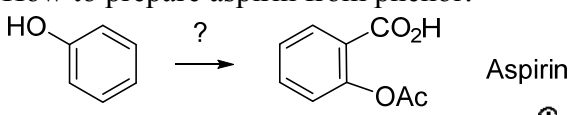
(B) 

(C) 

(D) 

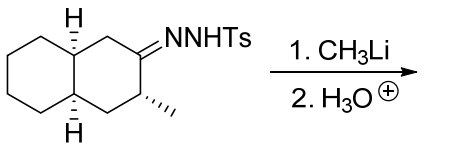
(E) None of the above

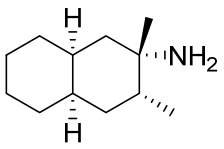
77. How to prepare aspirin from phenol?

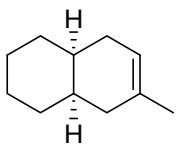


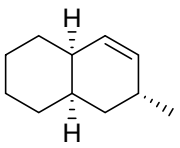
(A) 1. NaOH, CO_2 2. $H_3O^{\oplus}$ 3. Ac_2O
(B) 1. CH_3COCl, $AlCl_3$ 2. $NaNO_2$, then H_3PO_2 3. $H_3O^{\oplus}$
(C) 1. Ac_2O 2. $H_3O^{\oplus}$ 3. NaOH, CO_2
(D) 1. HNO_3, H_2SO_4 2. Fe, HCl 3. CH_3COCl, $AlCl_3$
(E) 1. Ac_2O 2. NaOH 3. CO_2, then $H_3O^{\oplus}$

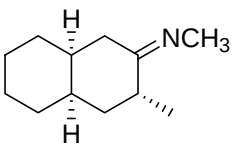
78. What is the **major** product of the following reaction?

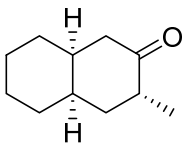


(A) 

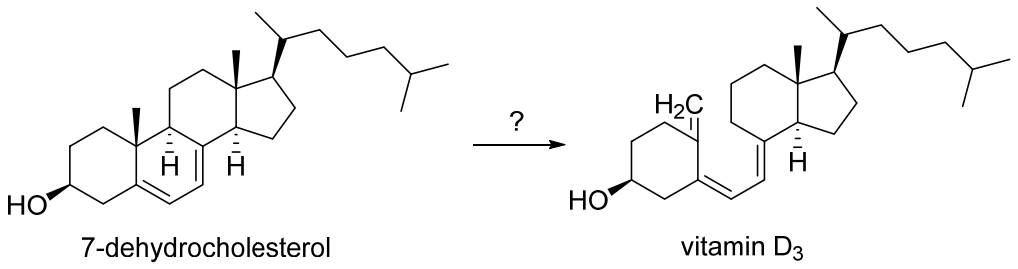
(B) 

(C) 

(D) 

(E) 

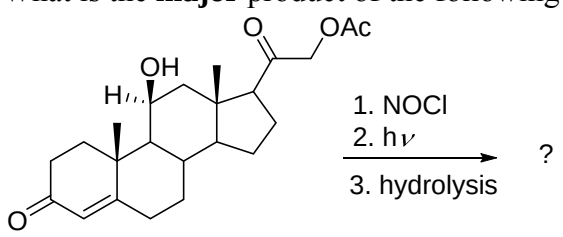
79. 7-Dehydrocholesterol, a steroid found in skin, is converted into vitamin D_3 by two pericyclic reactions. What are these two reactions?

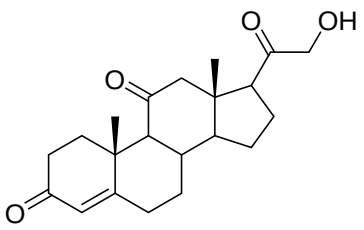


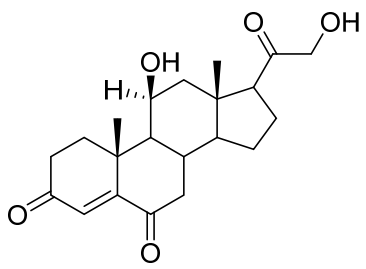
7-dehydrocholesterol vitamin D_3

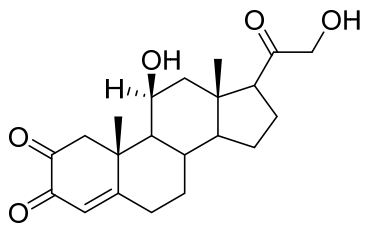
(A) 1. an electrocyclic reaction 2. an ene reaction
(B) 1. a [1,7] sigmatropic rearrangement 2. an electrocyclic reaction
(C) 1. an electrocyclic reaction 2. a [1,7] sigmatropic rearrangement
(D) 1. an ene reaction 2. an electrocyclic reaction
(E) 1. an ene reaction 2. a [1,7] sigmatropic rearrangement

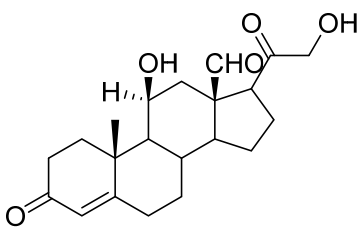
80. What is the **major** product of the following reaction?



(A) 

(B) 

(C) 

(D) 

(E) None of the above